

2023

# Final Evaluation of the M<sup>2</sup>ETaL Operation

CIOTEK LIMITED



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# Final Evaluation of the M<sup>2</sup>ETaL Operation



**Submitted by CIOTEK Limited**

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A final evaluation undertaken by  
CIOTEK Limited.

Revision 1.3

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<b>Glossary of Terms</b>	
<b>CCT</b>	Cross Cutting Themes
<b>CPD</b>	Continuing Professional Development
<b>EPF</b>	Economic Prioritisation Framework
<b>ESF</b>	European Social Fund
<b>EW</b>	East Wales
<b>M&amp;E</b>	Monitoring and Evaluation
<b>M<sup>2</sup>ETaL</b>	Materials and Manufacturing Education Training and Learning
<b>R&amp;D</b>	Research and Development
<b>WEFO</b>	Welsh European Funding Office
<b>WWV</b>	West Wales and the Valleys
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# Independent External Evaluation of the M<sup>2</sup>ETaL Operation

## Final Evaluation Report

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### Synopsis

The Materials and Manufacturing Education Training and Learning (M<sup>2</sup>ETaL) operation is an industry demand led project funded by the European Social Fund (ESF). The operation was originally due to run in West Wales and the Valleys (WWV) from June 2015 to August 2018 with a grant of £1,067,209, however, following a reprofile the operation was granted additional funding of £1,296,454 for WWV and £1,168,322 for East Wales (EW) (January 2019 to December 2021) leading to a 7-year pan Wales operation with a completion date of April 2023. The M<sup>2</sup>ETaL operation aims to upskill individuals in the field of Advanced Materials and Manufacturing through the provision of short, 10 credit courses at level 4 and above. M<sup>2</sup>ETaL is a work-based learning project that focuses on technical training modules to address skills shortages and provide industry with the skills required to thrive in a knowledge led sector.

The M<sup>2</sup>ETaL operation aligns with the WWV and EW Priority Axis 2 – Skills for Growth, Specific Objective 2, “to increase the number of people in the workforce with technical and job specific skills at an intermediate and higher level”.

The final evaluation report comprises the findings of an independent external evaluation of the M<sup>2</sup>ETaL operation including a review of achievements against targets, an assessment of plans for sustainability as well as conclusions and recommendations moving forward.

### Further Information

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## Executive Summary

This Final Evaluation Report comprises the findings of the external independent review of the Swansea University based M<sup>2</sup>ETaL operation. It incorporates data and information gathered throughout the operation including the Mid-Term Evaluation completed in September 2018, and ongoing data collected through to the completion of the operation. The report is an evaluation of the performance of the M<sup>2</sup>ETaL operation against its defined indicators.

This report also incorporates the strategic position of M<sup>2</sup>ETaL looking forward and reports on the impact achieved, and the potential demand and positioning of a future M<sup>2</sup>ETaL operation.

The objective of the M<sup>2</sup>ETaL operation has been to upskill individuals in the field of advanced materials and manufacturing through the provision of short, 10 credit courses at level 4 and above. M<sup>2</sup>ETaL is a work-based learning project that focuses on technical training modules to address skills shortages and provide industry with the skills required to thrive in a knowledge led sector.

The operation responded to and was proactive in taking actions against all six of the mid-term evaluation recommendations. This led to the following achievements: -

- Fourteen new courses being developed to meet specific industry requirements,
- Extending the number of networks in Wales with which it collaborated to 79 organisations and groups,
- Development and delivery of four industry specific introductory courses,
- Extended the geographical region served to include the EW region through gaining additional ESF funding,
- Planned for Continuing Professional Development (CPD), non-credit bearing for activities beyond the current funding period.
- Responded rapidly to COVID-19 restrictions on classroom courses by developing and delivering replacement online courses.

It was evidenced that, throughout its delivery, the M<sup>2</sup>ETaL operation has contributed directly to defined cross cutting themes (CCTs). including Equal Opportunities and Gender Mainstreaming, and Sustainable Development ensuring that the operation met social, economic, and environmental objectives simultaneously.

It was acknowledged that M<sup>2</sup>ETaL has excelled in all areas of CCT activity. The operation had 7 CCT case level indicators associated with its activity, and all have been delivered, with publicity outlining success through case studies, press releases and sharing good practice which has been an important part of the operation.

Additionally, it was seen that the M<sup>2</sup>ETaL operation aligned directly with five of the principles of the Well-Being of Future Generations Act.



The expansion of M<sup>2</sup>ETaL from WWV to a pan-Wales operation has resulted in two sets of indicator targets, split between WWV and EW. The total targets for each region and the operation's achievement in both regions are outlined in the Tables below.

Indicator West Wales and the Valleys	Total Target	Achievement to Date	Percentage Achieved
Participants with a Level 2 qualification – Male	282	223	79%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Male	215	179	83%
Participants with a Level 2 qualification – Female	10	6	60%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Female	8	5	63%
Participants with a Level 3 qualification – Male	621	555	89%
Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Male	466	427	92%
Participants with a Level 3 qualification – Female	87	95	109%
Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female	61	56	92%
<b>CCT Indicator</b>			
Operations integrating sustainable development into awareness raising, education and training programmes	1	1	100%

Whilst the operation fell short of a number of its WWV targets, M<sup>2</sup>ETaL achieved a significantly high percentage in a number of key areas. It was noted that the operation was required to cease the enrolment process in December 2022 and teaching delivery in February 2023. It was advised by the management team, that, given more time, the WWV reprofile targets would have been achieved.

Notably the operation exceeded the target of “female participants with a Level 3 qualification. The achievement of this target is particularly important as engineering

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Commented [LS4R3]: Amended.

continues to be a male-dominated profession, with only 16.5% of engineering roles being filled by females<sup>1</sup>. It was evidenced therefore, that M<sup>2</sup>ETaL is contributing directly to the upskilling of females in engineering related roles in Wales.

<b>Indicator EW</b>	<b>Total Target</b>	<b>Achievement to Date</b>	<b>Percentage Achieved</b>
<b>Participants with a Level 2 qualification – Male</b>	80	15	19%
<b>Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Male</b>	59	3	5%
<b>Participants with a Level 2 qualification – Female</b>	11	3	27%
<b>Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Female</b>	10	1	10%
<b>Participants with a Level 3 qualification – Male</b>	282	131	46%
<b>Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Male</b>	203	66	33%
<b>Participants with a Level 3 qualification – Female</b>	27	31	115%
<b>Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female</b>	18	20	111%
<b>CCT Indicator</b>			
<b>Operations integrating sustainable development into awareness raising, education and training programmes</b>	1	1	100%

<sup>1</sup> <https://www.engineeringuk.com/media/318037/women-in-engineering-report-summary-engineeringuk-march-2022.pdf>

It was noted that the M<sup>2</sup>ETaL operation has fallen short in the majority of its EW targets. This is in part, attributed to the numerous unforeseen challenges faced by the operation entering a new geographical region. It was found that the operation needed more time than had been allowed, to establish and build relationships with new organisations. Further to this, it was discovered that many organisations in North Wales had already established a legacy relationship with other training delivery organisations such as Coleg Cambria.

In South-East Wales, many of the organisations contacted were unused to receiving funding support. As such, they already had established training supply channels and were resistant to replace these supply channels with a programme which would be coming to an end. Combined with the associated ESF paperwork requirements this meant that the offering was not attractive to many potential client organisations.

It was also noted that the extension to EW occurred prior to the COVID-19 pandemic when the operation was providing face-to-face delivery. This presented a barrier to EW businesses in terms of cost and travel. Setting up and staffing training centres in EW was not seen as a viable option. To overcome these challenges the M<sup>2</sup>ETaL operation offered to deliver courses at the premises of the participating businesses, however, it was found that establishing relationships and building trust is a lengthy process. The culmination of these factors impacted significantly on M<sup>2</sup>ETaL meeting targets within the project timeframe.

However, as a positive achievement, it should be noted that the M<sup>2</sup>ETaL operation has exceeded its targets of “Participants with a Level 3 qualification – Female” achieving 115% and “Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female”, achieving 111%.

The evaluation survey revealed that 19 of the 21 participating businesses are happy with the delivery process (90%) with 95% reporting that M<sup>2</sup>ETaL had met their learning expectations and 95% reporting that the M<sup>2</sup>ETaL courses are relevant to Welsh industry and would like their employees would like to engage in further training.

There were multiple tangible employer benefits cited including 52 new employment positions, 10 new products introduced and 12 new procedures resulting from the training intervention. Intangible benefits resulting included raised staff confidence, increased flexibility of staff to take on new tasks, improved operational performance and a better response to problems.

Overall, it can be concluded that M<sup>2</sup>ETaL has demonstrated that it is an exceptional operation, with 20 of the 21 participating businesses citing the quality of the operation as good (4) or excellent (16).

The response from participating students was equally positive. Student course feedback obtained by M<sup>2</sup>ETaL throughout the operation for each course delivered

(Total of 457 course feedback reports) Of these 63% of the students perceived the courses as excellent, and 35% as good.

Of the 47 student responses obtained by CIOTEK's electronic questionnaire to a question relating to the desire to participate in further courses, 38 advised that they would like to participate in further M<sup>2</sup>ETaL courses, with an additional 6 not currently looking to participate in further modules, with 3 students stating they were unsure.

Overall, it has been evidenced that the M<sup>2</sup>ETaL operation has remained true to its ambitions and its achievements can be attributed to a number of key success factors which it is recommended are adopted as best practice for any future operation.

In summary these are:

- A clear vision combined with strong leadership focused on achieving impact and meeting defined targets
- Open engagement and discussion with participating businesses to identify their specific requirements
- Flexibility in the design and delivery of short courses and micro credentials in industry specific sectors
- A focus on key areas of expertise and establishment of a network of external support organisations.

## Recommendations

### Recommendation 1 – Maintain the Momentum

It is evidenced that M<sup>2</sup>ETaL has developed excellent relationships with a variety of companies and participants, with many signing up to complete multiple courses. The loss of momentum at this stage could have a detrimental impact, not only on the operation, but the participants utilising M<sup>2</sup>ETaL. As such, a break in transmission will result in the loss of key relationships with industry partners and the loss of knowledgeable and skilled staff working on the M<sup>2</sup>ETaL operation. Further to this, a loss of continuity will mean that the operation material that M<sup>2</sup>ETaL has strived to continuously enhance and improve to provide an accurate and updated reflection of current information will no longer be up to date. Therefore, it is recommended that M<sup>2</sup>ETaL seek ways by which it might continue the operation.

### Recommendation 2 – Seek Further Funding to become Self Sustaining

In order to continue the operation, it is recommended that M<sup>2</sup>ETaL seek additional funding. It is recommended that this be based on a business model which will become self-sustaining with 18 months based on “pump priming” funding as an enabler to allow the operation to establish relationships and allow time for organisations, used to grant funding, to become accustomed to paying for skills development training. Ironically it will be those outside the immediate region, not used to grant funding, that may prove

**Commented [CI(WRM&E5)]:** Student responses to what exactly? It seems from the much larger number of responses cited in the paragraph above that this is not the same as the course feedback?

**Commented [SL(6R5)]:** Reworded to add clarity. The larger number of students refers to feedback obtained by the operation after each course. The smaller number refers to the students that completed an electronic questionnaire developed by CIOTEK.

to be the most receptive. It is suggested that this funding should initially come from a combination of Swansea University and Welsh Government and should focus on the delivery of micro credentials (short, focused, and accredited courses that do not tie up employees for extended periods but deliver focused industry specific training). It is recommended that, to break the cycle of “grants culture” that there is a commercial charge put on these courses from the outset to establish the commercial viability of the operation in the shortest possible time.

### Recommendation 3 – Development of CPD

Many of the students and participating businesses emphasised the desire to utilise M<sup>2</sup>ETaL courses to enhance their knowledge and skills in specific areas relating to their employment. It is recommended that M<sup>2</sup>ETaL develop CPD courses (micro-credentials) that will address business needs rather than the attainment of a formal qualification.

### Recommendation 4 – Extend the Geographical Area of Delivery

Due to the constraints of the funding guidelines, the M<sup>2</sup>ETaL operation has been limited to a small geographical region. Beyond the current funding period, it is recommended that the operation extend its participant pool by offering courses both across the UK and internationally. With the move to online learning, the current delivery method lends itself particularly well to being an attractive opportunity for those in wider regions beyond Wales.

**Commented [CI(WRM&E7)]:** Is this a definition of micro-credentials? Should it be in brackets?

**Commented [CI(WRM&E8R7)]:** Also if this is not a definition of micro-credentials can one be added please?

**Commented [LS9R7]:** Brackets added to indicate a definition.

# 1

## Report Sections

Executive Summary

### Section 1: Introduction

Section 2: Mid-Term Report Outcomes

Section 3: Operational Review

Section 4: Evaluation Findings

Section 5: Conclusions and Recommendations

## 1. Introduction

The M<sup>2</sup>ETaL operation is an industry demand led project based within the Faculty of Science and Engineering at Swansea University which aims to upskill individuals in the field of Advanced Materials and Manufacturing through the provision of short, 10 credit courses at NQF level 4 and above. M<sup>2</sup>ETaL is a work-based learning project that focuses on technical training modules to address skills shortages and provide industry with the skills required to thrive in a knowledge led sector.

M<sup>2</sup>ETaL was originally a 3-year operation with a value of £1,495,430, focused on WWV, however the operation received a 4-year costed extension, taking the operation to a 7-year ESF funded operation with a total value of £5,037,565 and expanded to the EW region including North, Mid and South-East Wales. The operation aligns with the WWV and EW Priority Axis 2 – Skills for Growth, Specific Objective 2, “to increase the number of people in the workforce with technical and job specific skills at an intermediate and higher level”.

Through the aim of addressing the skills shortage in the materials and manufacturing workforce which will ultimately help secure sustainability for Welsh industry, the operation offers the following courses:

- Introduction to Materials Engineering
- Introduction to Fossil Free Steelmaking
- Corrosion and Coatings Technology
- Materials for Energy
- Introduction to Circular Economy
- Introduction to Semiconductor Manufacturing
- Manufacturing Technology
- Introduction to CAD, 2D & 3D
- Introduction to Aerospace Materials
- Introduction to Electric Vehicles
- Environmental Impact and Sustainability
- Engineering Analysis
- Introduction to Arc Welding
- Fluid and Pressure Systems
- Understanding Mechanical Testing

**Commented [CI(WRM&E10):** Could it be made clearer here that the project was ESF funded?

**Commented [LS11R10]:** ESF funded included.

- Process evolution in the steel Industry
- Introduction to Galvanising
- Introduction to Coke Oven Battery Operations
- Introduction to Joining Technology
- Introduction to Iron Ore Sintering Processing, chemistry, and Properties
- Steelmaking and Casting: theory, Process, and thermodynamics
- Hot rolling fundamentals
- Introduction to Fibre Optics Networks
- Energy and Power
- Advanced Imaging
- Introduction to Active Buildings
- Introduction to Tinplate
- Practical Metallurgy
- Introduction to Electric Arc Furnace

Along with these courses, M<sup>2</sup>ETaL provides an opportunity to tailor and develop modules around companies' general products and processes.

## 1.1 Evaluation Aims and Objectives

The final evaluation has the following objectives:

- Assess whether the recommendations from the mid-term evaluation have been implemented
- Evaluate the progress against targets
- Determine the contribution of the operation to Cross Cutting Theme (CCT) activities
- Analyse results and impacts from company and participant engagement
- Summarise challenges experienced by M<sup>2</sup>ETaL
- Provide an assessment of the overall impact of the operation and make recommendations beyond the life of the operation.

## 1.2 Evaluation Methodology

CIOTEK has developed the evaluation methodology for the operation in conjunction with the M<sup>2</sup>ETaL management team. A summary of the methodology has been outlined below:

### 1.2.1 Desk Research

The desk research undertaken by CIOTEK incorporated an extensive review of secondary research, publications, and operational documentation to:

- Understand the progress of the operation through a review of key documents including the Welsh European Funding Office (WEFO) progress reports, CCT indicators and other relevant update documents.
- Review Monitoring and Evaluation (M&E) processes to understand whether any changes have been introduced.

### 1.2.2 Field Research

CIOTEK also undertook field research for the evaluation including holding meetings with the management team to confirm the status of the operation and to discuss any specific operational or strategic changes that may impact the ongoing or future objectives.

In preparation for the final evaluation, CIOTEK consultants prepared questionnaires for the M<sup>2</sup>ETaL management, students and participating businesses that were approved by the M<sup>2</sup>ETaL project management team. Following the approval of these questionnaires, CIOTEK consultants undertook qualitative research that comprised online interviews as well as quantitative electronic questionnaires. The research conducted sought to identify:

#### 1.2.2.1 M<sup>2</sup>ETaL Management

- The implementation of the mid-term evaluation recommendations
- Delivery of key outputs and indicators
- Effectiveness of the management structure
- M&E processes
- Progress against CCTs
- Challenges experienced.
- SWOT analysis
- Impact of COVID-19

#### 1.2.2.2 Participating Businesses

- How they first became aware of M<sup>2</sup>ETaL
- Satisfaction with delivery methods
- Further courses wanted



- Expectations
- Relevance of training to Welsh industry
- Desire to engage in further training
- Benefits experienced
- Impact of COVID-19 and Brexit

### 1.2.2.3 Students

- Motivation for undertaking M<sup>2</sup>ETaL courses
- Importance of gaining knowledge and qualifications
- Rating of the M<sup>2</sup>ETaL courses
- Preferred delivery method
- Additional courses wanted
- Impacts of M<sup>2</sup>ETaL
- Barriers to participation
- How could M<sup>2</sup>ETaL be improved
- Desire to engage in further training
- Overall quality of courses

### 1.2.2.4 Stakeholders

- Opinion of M<sup>2</sup>ETaL's performance
- Current market needs
- Need for M<sup>2</sup>ETaL in the future
- Future funding opportunities

## 1.2.3 Data Analysis

- **Data collation and analysis** – CIOTEK collected primary data and reviewed secondary data provided by the management team. Primary data included qualitative data collection which took place with M<sup>2</sup>ETaL staff and participating businesses in the form of online interviews and quantitative data was collected from students via an electronic questionnaire. Additionally, secondary data was provided by M<sup>2</sup>ETaL in the form of student course feedback for each course run throughout the operation. The collated data gathered is presented in subsections. This includes an examination of deliverables and their impact and benefits.

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**Commented [LS13R12]:** Further detail added.

## 1.2.4 Conclusions and Outcomes

- **Conclusions and Outcomes** – Drawn from field and desk research.
- **Recommendations** – Will be made based on findings of research and data collection which can be used to inform any changes that can be made to enhance the operation moving forward.

### 1.2.5 Primary Research Scope

As part of the evaluation, CIOTEK collected interview and questionnaire data from M<sup>2</sup>ETaL internal team members, students, and participating businesses as well as reviewed course feedback provided by students to M<sup>2</sup>ETaL following the completion of each course.

Role	Organisation	
<b>M<sup>2</sup>ETaL Internal Team</b>	Project Manager	Swansea University
	Project Officer	Swansea University
	2 x PI	Swansea University
	eLearning Manager and Developer	Swansea University
	2 x Industrial Engagement Officers	Swansea University
	Tutor	Swansea University
<b>External Participants</b>	70 x Students (via electronic questionnaire)	Confidential
	727 x Students (via individual course feedback)	
	21 x Participating Businesses	Confidential
	2 x Stakeholders	Confidential

Table 1: Interview List

### 1.2.6 Secondary Research Scope

To supplement the primary research, CIOTEK has also undertaken a review of the following internal and external documents:

#### 1.2.6.1 Internal Documents

- Business Plan
- Monitoring and evaluation plan
- Marketing strategy
- WEFO quarterly progress reports

#### 1.2.6.2 External Documents

- How and Where the Advanced Material Industry is Set to Grow<sup>2</sup>
- Science for Wales<sup>3</sup>

<sup>2</sup> [https://advancedmaterialsshow.com/app/uploads/2020/02/eBook-Industry\\_insight-AMS2020.pdf](https://advancedmaterialsshow.com/app/uploads/2020/02/eBook-Industry_insight-AMS2020.pdf)

<sup>3</sup> <https://www.gov.wales/sites/default/files/publications/2019-05/science-for-wales-2017-report.pdf>

**Commented [CI(WRM&E14):** Please can more detail be given about the survey. Who was it distributed to ,when and how? How many responses were received? What did it ask respondents about?

**Commented [LS15R14]:** Detail of the questionnaires including distribution and respondents included above in Section 1.2.2.

**Commented [CI(WRM&E16):** Can a column be added to this detailing the number of each type of interview held? i.e. how many students were interviewed etc.?

**Commented [LS17R16]:** Number included.

- Economic Prioritisation Framework<sup>4</sup>
- Wales Innovates: Creating a stronger, fairer, greener Wales<sup>5</sup>
- Manufacturing Future for Wales<sup>6</sup>
- Manufacturing and Materials Review<sup>7</sup>
- Reducing Risk to Secure UK Advanced Materials Innovation<sup>8</sup>
- UK Innovation Strategy<sup>9</sup>

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<sup>4</sup> <https://www.gov.wales/sites/default/files/publications/2019-09/welsh-european-funds-economic-prioritisation-framework.pdf>

<sup>5</sup> <https://www.gov.wales/sites/default/files/publications/2023-02/wales-innovates-creating-a-stronger-fairer-greener-wales.pdf>

<sup>6</sup> <https://www.gov.wales/sites/default/files/publications/2021-02/manufacturing-future-for-wales-framework.pdf>

<sup>7</sup> <https://www.ukri.org/wp-content/uploads/2021/12/IUK-061221-MaterialsAndManufacturingReview.pdf>

<sup>8</sup> <https://www.iom3.org/resource/reducing-risk-to-secure-uk-advanced-materials-innovation.html>

<sup>9</sup> <https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it/uk-innovation-strategy-leading-the-future-by-creating-it-accessible-webpage>

# 2

## Report Sections

Executive Summary

Section 1: Introduction

**Section 2: Mid-Term Report Outcomes**

Section 3: Operational Review

Section 4: Evaluation Findings

Section 5: Conclusions and Recommendations

## 2. Mid-Term Report Outcomes

This section outlines the findings and recommendations made during the mid-term evaluation of M<sup>2</sup>ETaL and reports on the actions taken to address the recommendations.

### 2.1. Summary of Findings

The M<sup>2</sup>ETaL operation was found to be well aligned with the Welsh Government's economic priorities under the grand challenge theme of Advanced Engineering and Materials. M<sup>2</sup>ETaL maps against a number of the key demand drivers within the manufacturing sector, a key funding priority for the Economic Prioritisation Framework. This included upskilling the workforce for anchor companies, associated supply chains, SMEs and industries within the advanced materials and manufacturing sector.

M<sup>2</sup>ETaL had the advantage of being a follow-up project from its predecessor METaL. Experience gained led the project to become more flexible in the delivery of courses such as offering training on selected days to meet business needs and developing a suite of online courses.

The operation aligned closely with its original planning documents, and the initial M&E documents. The existing processes were developed with sufficient detail to allow for the evaluation of impact when coupled with participant feedback and company case studies. The data collection systems had been refined and improved on an ongoing basis to ensure efficiency and fit for purpose.

At the time of the mid-term, the operation was falling behind target with some of the outputs, particularly in relation to gender related targets where female participation levels in the manufacturing and engineering sectors are, by nature, much lower than their male counterparts. In addition, targets concerning participants with work limiting health conditions were also a challenge, as the nature of the work being undertaken by participants was such that there were fewer numbers with work limiting health conditions (compared to office work for example). However, the operation was actively participating in and attending events that recognise women and other participants with work limiting health conditions in science and engineering sectors.

In other areas, the operation was exceeding targets, and with the reprofile awarding both additional time and money to the operation, M<sup>2</sup>ETaL had a significant opportunity to move forward with additional resources to increase engagement activity to gain more participants.

The operation was proactive in conducting several CCT activities over and above that outlined in the business plan including bespoke sustainability and environmental training modules, operation team initiatives to minimise waste, and outreach activities to encourage women's participation in STEM subjects.

The participants and participating businesses provided positive feedback including M<sup>2</sup>ETaL had helped them do their job more effectively by improving knowledge. In respect of participating businesses' feedback, there was a high rating for the engagement process, the ease of being able to contact M<sup>2</sup>ETaL and for its value for money. Participating businesses also praised the operation for having good communication and engagement whenever a problem was encountered.

## 2.2. Mid-Term Evaluation Recommendations

### Recommendation 1 – Expand Course Offering

It was recommended that the operation team undertake a research exercise to identify company knowledge gaps and explore additional eligible topic areas for new training courses

### Recommendation 1 – Actions Taken

The operation conducted research both with industry and government bodies and identified the net zero commitments/decarbonisation Welsh Government targets needed training support. As a result, the operation developed the following courses:

- Environmental Impact and Sustainability
- Introduction to Fossil Free Steelmaking
- Introduction to Electric Vehicles
- Environmental Issues – Taking the Lead in Environmental Management
- Introduction to Circular Economy
- Materials for Energy

The project also identified numeracy skills within industry as an issue and developed:

- Engineering Analysis

This course covers the fundamental maths required for in-depth analysis that industry can use to deliver process improvements and cost reductions.

Commented [CI(WRM&E18)]: The following courses?

Commented [LS19R18]: Added.

### **Recommendation 2 – Extending Engagement Reach**

The operation should utilise existing networks in Wales to identify opportunities for increasing the number of training course participants.

#### **Recommendation 2 – Actions Taken**

The operation has worked with the following networks to address this recommendation:

- 24 Local Authority/Welsh Government bodies
- 27 industry network groups
- 12 employment, skills charities/groups/networking bodies
- 15 Higher Education, Further Education, and educational bodies

### **Recommendation 3 – Focussed Targeting Approach**

It was recommended that the M<sup>2</sup>ETaL operation evaluates the options of delivering specific in-house training packages, as well as bespoke training for specific manufacturing sectors.

#### **Recommendation 3 – Actions Taken**

M<sup>2</sup>ETaL has delivered specific sector courses such as:

- Introduction to Semiconductor Manufacturing
- Introduction to Fossil Free Steelmaking
- Introduction to Aerospace Materials
- Introduction to Electric Vehicles

The operation has also engaged with individual companies to adapt generic courses to reflect their processes.

### **Recommendation 4 – Extend Geographical Region**

The operation should seek to extend the geographical boundaries of the operation and seek additional funding to support this.

#### **Recommendation 4 – Actions Taken**

In 2019, the operation was successful in gaining £1,251,366 in ESF funding to support the EW region. The operation is now a pan Wales operation and has achieved outputs across all regions of Wales.

### **Recommendation 5 – Consider Short Courses**

Explore the opportunities for and the demand for short courses (1 day) in addition to the existing courses.

### **Recommendation 5 – Actions Taken**

Swansea University were not able to give accreditation for one day courses. This meant M<sup>2</sup>ETaL were unable to facilitate participants gaining a qualification through the University. M<sup>2</sup>ETaL was funded through Welsh Government skills priority, specifically the upskilling of employees in Welsh industry, therefore M<sup>2</sup>ETaL were required to show the attainment of a qualification and without the accreditation of Swansea University, this could not be achieved.

The M<sup>2</sup>ETaL team has plans including short courses for Continuing Professional Development (CPD), non-credit bearing for activities beyond the current funding.

### **Recommendation 6 – Course Delivery and Materials**

It was recommended that the course presentation slides be altered by putting less on the screen and leaving more room for discussion and activities. It was also recommended that participants be provided with a blank workbook with several activities to complete on each day of the course instead of providing all materials to participants on the first day of the course.

### **Recommendation 6 – Actions Taken**

M<sup>2</sup>ETaL implemented the recommendations in the classroom courses, however, since the mid-term evaluation, the operation has dealt with the consequences of COVID-19 and had to reassess its provision for delivering courses. Due to COVID-19, M<sup>2</sup>ETaL developed fully online courses which include videos, animations, regular tests, and assessments, as well as tutor support upon request. The operation now offers blended learning experiences of face-to-face classroom and online learning to facilitate all types of learning styles.

# 3

## Report Sections

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## 3. Operational Review

Section 3 will focus on reviewing the M<sup>2</sup>ETaL operation including an assessment of the operation context, progress against targets, CCT activities and contributions to the goals of the Well-Being of Future Generations Act.

### 3.1. M<sup>2</sup>ETaL Context

Many high-tech industrial sectors such as the automotive, aerospace, medical, electronics and energy industries rely on cutting-edge materials and are adopting advanced materials in commercial applications. This has meant that the advanced materials industry has been growing worldwide and is expected to have a market reach of over \$1.9 billion by 2024<sup>10</sup>.

M<sup>2</sup>ETaL aligns with the ESF EW and WWV Priority Axis 2: Skills for Growth, Specific Objective 2: to increase the number of people in the workforce with technical and job specific skills at an intermediate and higher level. M<sup>2</sup>ETaL focuses on the economic opportunities under the grand challenge theme of Advanced Engineering and Materials as indicated in Science for Wales<sup>11</sup> and Advanced Manufacturing in the Economic Prioritisation Framework (EPF)<sup>12</sup>.

A strong advanced industrial sector depends critically on the science base and the input of highly skilled individuals into companies to elevate them in the value-added chain. Following on from the Science for Wales document, the Wales Innovates<sup>13</sup> policy published in February 2023 outlines the importance of the advanced materials and manufacturing sector and the need for Wales to increase its productivity through the application of research.

The EPF sees increasing productivity levels and driving skill and employment levels as a key priority in the WWV and EW regions within the engineering sector.

<sup>10</sup> [https://advancedmaterialsshow.com/app/uploads/2020/02/eBook-Industry\\_insight-AMS2020.pdf](https://advancedmaterialsshow.com/app/uploads/2020/02/eBook-Industry_insight-AMS2020.pdf)

<sup>11</sup> <https://www.gov.wales/sites/default/files/publications/2019-05/science-for-wales-2017-report.pdf>

<sup>12</sup> <https://www.gov.wales/sites/default/files/publications/2019-09/welsh-european-funds-economic-prioritisation-framework.pdf>

<sup>13</sup> <https://www.gov.wales/sites/default/files/publications/2023-02/wales-innovates-creating-a-stronger-fairer-greener-wales.pdf>



Manufacturing is a larger proportion of the Welsh economy than the UK as a whole and has been undergoing a transition from low skilled, low productivity to more advanced manufacturing capability built on higher skills in emerging clusters and areas of expertise and the pursuit of excellence. Key markets exhibiting growth include aerospace, automotive and rail, alongside opportunities resulting from the growing take-up of technologies such as composite and alloy materials, photonics, automation, and net shape and additive manufacturing.

Advanced manufacturing is closely linked to research and innovation and attracts a large amount of research and innovation funding, particularly relating to the development and production of advanced materials. The Welsh Government's strategy for the Advanced Materials and Manufacturing sector includes supporting innovation and growth in the industry, developing a skilled workforce, and promoting sustainable practices. Some specific initiatives include funding for research and development, support for start-up companies, and investment in infrastructure and equipment. The government also partners with industry associations and academic institutions to promote collaboration and knowledge-sharing within the sector.

Wales has a skilled workforce with a broad range of manufacturing expertise and a focus on innovation and collaboration between industry, government, and academic institutions. In this area, Wales has a skilled workforce of 145,000, with Welsh universities producing over 2,000 engineering graduates every year as well as 160 aerospace and defence companies, which employ 20,000 people and produce a turnover of more than £5 billion. Wales' productivity in the manufacturing sector is higher than the UK average and accounts for 10% of all workforce jobs in Wales<sup>14</sup>.

Manufacturing in the UK accounts for approximately 8% of jobs and 10% of economic output, yielding 42% of UK exports and 65% of UK research and development spending. It is noted that a successful advanced materials and manufacturing sector is fundamental to the prosperity of the UK. It is especially crucial post COVID-19 and is essential for long-term economic growth and resilience<sup>15</sup>. The UK advanced materials and manufacturing sector is a success story and a critical driver of innovation and new technology. It offers considerable benefit to the defence and security of the UK, particularly within the areas of aerospace and maritime. It is also well placed to meet the Department of Business, Energy & Industrial Strategy's enterprise, business, net-zero, and innovation goals<sup>16</sup>.

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<sup>14</sup> <https://www.gov.wales/sites/default/files/pdf-versions/2022/3/1/1647865867/manufacturing-future-wales-framework.pdf>

<sup>15</sup> <https://www.ukri.org/wp-content/uploads/2021/12/IUK-061221-MaterialsAndManufacturingReview.pdf>

<sup>16</sup> <https://www.iom3.org/resource/reducing-risk-to-secure-uk-advanced-materials-innovation.html>

The UK Innovation Strategy<sup>17</sup> sets out the government's vision to make the UK a global hub for innovation by 2035. Pillar 4 is focused on Missions & Technologies in which they aim to stimulate innovation to tackle major challenges faced by the UK and the world and drive capability in key technologies. Within this pillar, seven technology families where the UK has globally competitive research and development (R&D) and industrial strength are identified. These technology families are transformational technologies that aim to drive change over the coming decades. The first of these technology families is advanced materials and manufacturing. The strategy identifies that learning to manufacture advanced materials at scale and incorporating safety and sustainability into their design and innovation is as important as the discovery and development of these materials. This effort is essential to unlocking innovation across all major industrial sectors. The UK has a world leading advanced materials science base and there are many opportunities to continue innovation. Manufacturing these advanced materials at scale requires new technologies and processes. The UK industry is at the forefront of developing these as it evolves from supplying distinct materials such as metals, polymers, and ceramics, to supplying finished components and systems for medical, energy, and aerospace sectors. Collaboration between academics and industry has been crucial to this.

### 3.2. Monitoring and Evaluation

M<sup>2</sup>ETaL has evidenced a detailed M&E plan that has been updated throughout the operation. The M&E plan outlines:

- Evaluation objectives
- Lessons learned
- Operational context
- Analysis and evidence of context, policy, and links to OP
- Activities to be undertaken
- Management responsibilities
- Delivery plan
- Monitoring
- Indicators and targets
- Monitoring system
- Data quality and protection

The responsibility of M&E activities is held by the project manager and the M<sup>2</sup>ETaL management team discusses M&E progress with WEFO during the quarterly project meetings.

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<sup>17</sup> <https://www.gov.uk/government/publications/uk-innovation-strategy-leading-the-future-by-creating-it/uk-innovation-strategy-leading-the-future-by-creating-it-accessible-webpage>

### 3.3. Data Collection

M<sup>2</sup>ETaL has a comprehensive process in place for capturing the data required by WEFO. The data is captured using the following:

- **Participant enrolment form** – captures all participant personal information including contact details, course information, communication preferences, education details, employer information and equal opportunities information for statistical purposes
- **Employer enrolment form** – captures employer name, contact details, sector details, communication preferences and statistical information relating to turnover, company structure, CCTs, and evidence in relation to WEFO targets
- **Expenditure transaction monitoring** – a spreadsheet that tracks all types of expenditure and its beneficiaries, financial references, descriptions of expenditure and figures relating to invoicing, VAT and eligible and ineligible amounts claimed.
- **Enterprise database** – a spreadsheet monitoring system that logs all companies engaging with the project, using the employer enrolment form information
- **Outputs database** – a spreadsheet monitoring system that tracks all project indicators according to the estimated target against actual for each quarter
- **Participant database** – a spreadsheet monitoring system that logs all participants on M<sup>2</sup>ETaL courses, using information from the participant enrolment form
- **Income monitoring** – a spreadsheet that tracks all types of income, its source, dates received and the amount of eligible and ineligible income
- **Assessment of course feedback** – a spreadsheet that contains all the collated results of course feedback

### 3.4. Marketing and Engagement

The operation has undertaken a range of marketing and promotional activities for M<sup>2</sup>ETaL.

- Presented at two of the 4thRegion Skills events.
- Attended the M2A conference which was attended by many industry representatives.
- Produced articles and information regarding the success of the operation to celebrate 10 years since the beginning of M<sup>2</sup>ETaL.
- Featured in the Swansea Bay Regional Engagement Team newsletter.
- Attended virtual marketing events such as Autolink, ESSA conference, and regional skills meetings.

- Encouraged other university projects to write guest blogs on the M<sup>2</sup>ETaL website. This has allowed other projects to reach the M<sup>2</sup>ETaL audience to learn about other support that is available throughout the university. The cross-project communication encourages further discussions.
- The operation continues to maintain contact with industry contacts through social media, newsletters, and blog posts.
- The operation has increased the number of short videos posted on the M<sup>2</sup>ETaL YouTube channel and regularly updates this content to compliment its courses.
- The operation has been involved in a number of Welsh Government and local Government visits to the University to explain the benefits and success of work-based learning.
  - One outcome of these visits has included M<sup>2</sup>ETaL being mentioned in the Senedd as a high-quality project that upskills people in the field of advanced materials and manufacturing and also proactively encourages women to participate<sup>18</sup>.

### 3.5. Cross Cutting Themes

It was evidenced that, throughout its delivery, the M<sup>2</sup>ETaL operation has contributed directly to defined cross cutting themes (CCTs). including Equal Opportunities and Gender Mainstreaming which aims to reduce injustice and promote social cohesion and Sustainable Development which aims to ensure that operations meet social, economic, and environmental objectives simultaneously<sup>19</sup>.

#### Equal Opportunities and Gender Mainstreaming

The operation supports and follows institutions on social media and through the website to endorse equal opportunities and gender mainstreaming. The operation has signposted to other networks and projects that were relevant. The operation follows equal opportunities policies when recruiting, leading to a very diverse team in terms of gender, ethnicity, and age.

The operation supported the STEM careers event to help promote the vast career opportunities that are available for all.

#### Sustainable Development

The operation has undertaken a number of activities relating to sustainable development. The operation has dedicated course materials and courses in environmental issues, environmental sustainability, circular economy, materials for

<sup>18</sup> <http://www.senedd.tv/Meeting/Clip/61067499-3556-46cb-95e9-f5663764e99e?inPoint=00:07:00&outPoint=00:09:49#>

<sup>19</sup> <https://www.gov.wales/docs/wefo/publications/170213-cct-erdf-key-document-en.pdf>

energy, electric vehicles, and introduction to fossil free steelmaking. All of the courses provided by M<sup>2</sup>ETaL include a section on sustainability and environmental management.

M<sup>2</sup>ETaL has developed a number of short videos to 'jargon bust' some of the terminology surrounding environmental issues and sustainability. There are many different terms that are being widely used in this field and the project has been proactively trying to engage with people to explain the difference between all terminology to help people have a better understanding of the impact of climate change, circular economy etc.

The operation supported Swansea University on its social media campaign highlighting climate action at Swansea University from COP26<sup>2021</sup>.

The M<sup>2</sup>ETaL management staff identified a challenge faced regarding sustainable development which was the interface between academic understanding of the issues and industry needs. For example, circular economy is a term understood within academic circles, however, the applicability of this to industry has not been understood unit recently, hence bridging this knowledge gap was seen as a challenge.

### **Welsh Language**

Despite the insufficient demand for Welsh language provision for technical courses, the M<sup>2</sup>ETaL operation has contributed to the use of the Welsh language through the provision of the M<sup>2</sup>ETaL website and all courses to be available in Welsh.

### **Additional Activities**

Beyond the defined CCT's, the operation has also undertaken a number of additional activities. Swansea University held events to commemorate Holocaust Day. Through the operation's social media channels, International Men's Day – Men Care Too was promoted to highlight 'what it means to be a male carer'. The operation also supported Swansea Science Festival which included over 30 events for adults and children to explore the magic of oxygen, the science of art of dreams, the wonders from ancient Egypt, coffee cups made from coffee and lots more. Swansea University continues to support staff through many of life's difficult situations and during October 2020, the University encouraged staff to support Baby Loss Awareness Week 2020.

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<sup>20</sup> [https://twitter.com/METaL\\_Project/status/1471765933626740736](https://twitter.com/METaL_Project/status/1471765933626740736)

<sup>21</sup> [https://twitter.com/METaL\\_Project/status/1489525854195654657](https://twitter.com/METaL_Project/status/1489525854195654657)

### **3.5.1. Well-Being of Future Generations Act**

M<sup>2</sup>ETaL aligns with the principles of the Well-Being of Future Generations Act as shown below:

#### **A Prosperous Wales**

M<sup>2</sup>ETaL has enabled people to gain access to technical knowledge and education which can lead to increased levels of confidence and engagement in employment. This ensures the growth of a prosperous Wales and allows people to take advantage of wealth generated through reliable, secure work.

#### **A Resilient Wales**

Access to technical courses enables people and industry to make informed decisions about the environment, technological changes, and the wider community impacts. Therefore, building resilience towards an ever-changing future.

#### **A More Equal Wales**

To participate in the M<sup>2</sup>ETaL courses, participants were not required to hold qualifications in the subject areas. This has meant that participants with limited or no qualifications in these areas could still gain access to the courses offered. This also allowed people to different subjects to enhance their knowledge and thus engage more widely within their communities.

#### **A Wales of Cohesive Communities**

Due to the nature of M<sup>2</sup>ETaL, participants from all areas of Wales in a variety of industry sectors could connect through technical discussions and courses leading to stronger communities, particularly, between academia and industry.

#### **A Globally Responsible Wales**

Educating people on the changes in technology or the impacts of existing technology on the environment and society enables people and industries to make informed decisions regarding their actions. This can ensure that Wales is globally responsible.

### 3.6. Testimonials

The operation has published a range of testimonials on the website<sup>22</sup> which outline the opportunities and help that M<sup>2</sup>ETaL has provided.

*“On completion of the first module, ‘Introduction to Fossil Free Steelmaking’, I was keen to learn more. I subsequently went on to complete the ‘Introduction to Coke Oven Battery Operations’, ‘Understanding Mechanical Testing’ and ‘Practical Metallurgy’ modules. I found the METaL courses invaluable and the knowledge and support within the METaL team is second to none. I highly recommend the training they have on offer”.*

*“It was a great course, I enjoyed taking part and found the content and resources to be thorough and of high quality. Thank you for all the help and support you gave to me. It supplemented my previous corrosion knowledge and experience well.”*

*“Flexibility from myself and METaL has made studying the courses very enjoyable. I have signed up for two modules as I feel that the flexible format means there is no reason why I cannot complete more than one qualification”.*

*“I think the modules will be extremely beneficial, I work in heavy industry and to be able to do courses relevant to my role means that I can enjoy the work and study more. There aren’t many courses available that are particularly useful or relevant to the role I do, so to be offered METaL modules relevant to steel industry was an opportunity I could not pass up. The knowledge I’ve gained makes me a better operator in my role as I now understand the full process”.*

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<sup>22</sup> <https://www.project-metal.co.uk/testimonials>

# 4

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## 4. Evaluation Findings

CIOTEK collected data from the M<sup>2</sup>ETaL management team, staff, participating businesses, and students. The collated results of this data collection are presented below.

### 4.1. Achievement Against Targets

The expansion of M<sup>2</sup>ETaL from WWV to a pan-Wales operation has resulted in two sets of indicator targets, split between WWV and EW. The total targets for each region and the operation's achievement in both regions are outlined in the Tables below.

#### 4.1.1. WWV

Indicator	Total Target	Achievement to Date	Percentage Achieved
Participants with a Level 2 qualification – Male	282	223	79%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Male	215	179	83%
Participants with a Level 2 qualification – Female	10	6	60%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Female	8	5	63%
Participants with a Level 3 qualification – Male	621	555	89%



<b>Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Male</b>	466	427	92%
<b>Participants with a Level 3 qualification – Female</b>	87	95	109%
<b>Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female</b>	61	56	92%
<b>CCT Indicator</b>			
<b>Operations integrating sustainable development into awareness raising, education and training programmes</b>	1	1	100%

Table 2: Indicator Achievements - WWV

Whilst the M<sup>2</sup>ETaL operation fell short of a number of its WWV targets, it achieved a significantly high percentage in a number of key areas. It was noted that the operation was required to cease the enrolment process in December 2022 and teaching delivery in February 2023. It was advised by the management team, that, given more time, the WWV reprofile targets would have been achieved.

Notably, the M<sup>2</sup>ETaL operation exceeded the target of “female participants with a Level 3 qualification. The achievement of this target is particularly important as engineering continues to be a male-dominated profession, with only 16.5% of engineering roles filled by females<sup>23</sup>. It was evidenced therefore, that M<sup>2</sup>ETaL is contributing directly to the upskilling of females in engineering related roles in Wales. This achievement is noted to be due to a combination of flexible online delivery and the environment/climate focused training content. The engineering sector being male dominant could also explain why the M<sup>2</sup>ETaL operation fell short of targets, particularly in relation to female participation. Further to this, the industry has been affected by COVID-19, Brexit, the economic downturn, and the rising cost of energy; this combination of events was noted to result in businesses making significant adjustments to their respected operational models. One of the consequences of this was the ability to release staff for training and upskilling. It was indicated by the M<sup>2</sup>ETaL management team that the operation worked extensively to build good industrial engagement relationships to minimise these variances.

<sup>23</sup> <https://www.engineeringuk.com/media/318037/women-in-engineering-report-summary-engineeringuk-march-2022.pdf>

**Commented [CI(WRM&E20):** Some discussion of the targets not met and possible reasons why would be beneficial here (like that included in the EW section below), particularly as the targets not within tolerance +/- 15% all pertain to female participants yet the level 3 target for females was exceeded

**Commented [SL(21R20):** Additional information included.

**Commented [CI(WRM&E22):** Please add the years here

**Commented [LS23R22):** Dates added.

#### 4.1.2. EW

Indicator	Total Target	Achievement to Date	Percentage Achieved
Participants with a Level 2 qualification – Male	80	15	19%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Male	59	3	5%
Participants with a Level 2 qualification – Female	11	3	27%
Gaining a technical or job specific vocational qualification upon leaving at Level 2 or above – Female	10	1	10%
Participants with a Level 3 qualification – Male	282	131	46%
Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Male	203	66	33%
Participants with a Level 3 qualification – Female	27	31	115%
Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female	18	20	111%
<b>CCT Indicator</b>			
Operations integrating sustainable development into awareness raising, education and training programmes	1	1	100%

Table 3: Indicator Achievements – EW

It was noted that the M<sup>2</sup>ETaL operation has fallen short in the majority of its EW targets. This is in part, attributed to the numerous unforeseen challenges faced by the operation entering a new geographical region. It was found that the operation needed more time than had been allowed, to establish and build relationships with new organisations. Further to this, it was discovered that many organisations in North Wales had already established a legacy relationship with other training delivery organisations such as Coleg Cambria.

In South-East Wales, many of the organisations contacted were unused to receiving funding support. As such, they already had established training supply channels and were resistant to replace these supply channels with a programme which would be coming to an end. Combined with the associated ESF paperwork requirements meant that the offering was not attractive to many potential client organisations.

It was also noted that the extension to EW occurred prior to the COVID-19 pandemic when the operation was providing face-to-face delivery. This presented a barrier to EW businesses in terms of cost and travel. Setting up and staff training centres in EW was not seen as a viable option. To overcome these challenges the M<sup>2</sup>ETaL operation offered to deliver courses at the premises of the organisations, however, it was found that establishing relationships and building trust is a lengthy process. The culmination of these factors impacted significantly on M<sup>2</sup>ETaL meeting targets within the project timeframe.

However, as a positive achievement, it should be noted that the operation has exceeded its targets of “Participants with a Level 3 qualification – Female” achieving 115% and “Gaining a technical or job specific vocational qualification upon leaving at Level 3 or above – Female”, achieving 111%.

#### 4.1.3. Additional Target Outputs

Indicator		Total Target	Achievement to Date	Percentage Achieved
Male	West	903	778	86%
	East	362	146	40%
Female	West	97	101	104%
	East	38	34	89%
Disability	West	27	20	74%
	East	9	6	67%
Work Limiting Health	West	18	6	33%
	East	10	3	30%
Black, Asian, and Minority Ethnic	West	45	56	124%
	East	24	15	63%
Older (Over 54)	West	18	21	117%
	East	9	9	100%
Young (Under 25)	West	320	345	108%
	East	137	55	40%
Migrant	West	45	47	104%
	East	24	11	46%

Carer Responsibilities	West	80	80	100%
	East	31	15	48%

Table 4: Additional Target Outputs

M<sup>2</sup>ETaL has made excellent contributions towards the additional output targets, particularly in West Wales. The operation has exceeded 6 of its targets in West Wales including students identifying as female, Black, Asian, and Minority Ethnic, Older, young, migrant, and as having carer responsibilities. The operation also has a high percentage achievement of male students and those with a disability in West Wales.

Due to the challenges faced in recruitment, the operation has fallen short of output targets in EW. However, it should be noted that the EW operation has achieved a high percentage of female students and has additionally achieved 100% of its older students' target.

Commented [CI(WRM&E24)]: East Wales operation?

Commented [LS25R24]: EW added.

## 4.2. M<sup>2</sup>ETaL Staff

The final evaluation collected data from 8 M<sup>2</sup>ETaL team members including the management team and staff.

### 4.2.1. Delivery Against Business Plan

The M<sup>2</sup>ETaL staff reported that the operation has successfully delivered against the remit of the business plan which had the objective of upskilling the Welsh workforce from the advanced manufacturing sector. The operation has delivered technical courses to over 1000 individuals across Wales and has, importantly, provided opportunities for females to upskill in a male dominated sector. The operation has also successfully implemented strategies to get industry and participants involved in work-based learning and training.

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### 4.2.2. Influence of the Operation

The M<sup>2</sup>ETaL team identified that the operation has influenced the marketplace. The operation's social media accounts have numerous followers which grow continuously. The operation also has a 22% return rate for people gaining access to further courses. The staff also highlighted that the feedback and testimonials received by students and businesses show the influence that the operation has had.

The operation has been successful in upskilling Welsh industry, enhancing opportunities for the future, meeting business demands and giving confidence to individuals. It was noted that the industrial engagement for the M<sup>2</sup>ETaL operation has been exceptional, with over 2000 industrial contacts regularly providing feedback. Throughout the life of the operation, the staff has attended over 300 networking events

including industrial, Government and academic events throughout Wales. The operation also has a continuous feedback loop to highlight trends and needs of the industry.

The improved structure of new course modules to meet the specific needs of businesses has been well received by participating businesses, many of whom have reported benefits such as in-plant process efficiencies and productivity improvements. The accreditation process has also addressed specific knowledge gaps in the workforce.

The operation has also collaborated with other European funded operations including ASTUTE, ION and Technocamps to provide opportunities to further upskill the Welsh industry.

#### **4.2.3. Additional Demand for Training**

The M<sup>2</sup>ETaL staff has identified additional demand for training beyond what is currently offered by M<sup>2</sup>ETaL. The speed of technological change is dramatic, and training is always required in leading edge issues. Metals industries are continuously in flux and there is a huge challenge for businesses to make metal production a cleaner and decarbonised basis. New processes need to be understood to tackle this challenge and short training modules can address this.

Due to the lack of funding, M<sup>2</sup>ETaL was unable to develop further courses in areas suggested by businesses including carbon capture, decarbonisation, the green agenda, circular economy, AI, industry 4.0, big data and virtual reality. It was noted that many of the participants had heard of these issues but, in reality, knew little about them. This presents a key opportunity to offer commercial courses in the future. However, it should be noted that although participating businesses are keen to acquire the courses and associated materials, many are reluctant to pay.

#### **4.2.4. Delivery Method offered**

It has been determined that the delivery method offered by M<sup>2</sup>ETaL was appropriate for students and industry. The M<sup>2</sup>ETaL operation offered both classroom and fully online courses which were seen as very effective and productive. The use of mixed delivery methods meant that students had greater understanding of the content due to the use of animations within all the courses which led to complex processes being broken down into bitesize educational videos, as well as effective interactions between the tutors and students through assessments, in-class tests, videos, quizzes, and group work.

It was identified that short courses were ideal for both participants and industry as the need for knowledge within the workplace can be time constrained. The opportunity to gain knowledge over a short period of time was beneficial for all.

Further to this, both participants and businesses want to increase knowledge in a subject area and to inform decisions rather than just the receipt of a qualification. M<sup>2</sup>ETaL bridges the gap by providing a focused knowledge base to allow businesses to make informed decisions and improve the overall knowledge within their team.

Due to the industrial engagement resource, M<sup>2</sup>ETaL has become a signposting source for businesses. This is important as the university seeks to strengthen academic-industry relationships moving forward and should look to this established portal as a way to enhance and develop established relationships.

#### **4.2.5. Learning Expectations of Participants**

It was identified that the information conveyed within the courses provided by M<sup>2</sup>ETaL meets the learning expectations of participants and businesses. The feedback provided by participants allows M<sup>2</sup>ETaL to alter any materials that do not meet the learning expectations of students. M<sup>2</sup>ETaL has been exemplary in using feedback loops to refine and enhance the training content.

It has been a priority of M<sup>2</sup>ETaL to provide specific training to industry to upskill individuals that have gaps in their current knowledge, to achieve improved accreditation levels, and to enable employees to apply more modern techniques and understand complex technologies used in production processes. The development of a recognised qualification was a real incentive for individuals to support continuous personal development.

#### **4.2.6. M<sup>2</sup>ETaL Management**

The M<sup>2</sup>ETaL management team have been excellent throughout the operation. They have been very supportive and always available for open and honest discussions. Staff have engaged in personal development reviews, which have been a good platform to discuss training needs, as well as weekly update meetings.

The management team are available and accessible whenever needed and are swift to respond to requests. The M<sup>2</sup>ETaL staff have a clear understanding of their tasks and requirements.

#### **4.2.7. Challenges Faced**

M<sup>2</sup>ETaL has faced challenges throughout the operation, particularly relating to participating businesses. In EW especially, the operation has faced difficulty in establishing relationships with businesses within short timescales. This challenge was partially addressed through the employment of a dedicated industry engagement officer.

Identification of the specific training and skills participating businesses needed was challenging due to each business having differing requirements. Furthermore, some businesses could not support the duration of 3-day courses.

Despite the operation providing businesses with the opportunity to upskill staff members in specific areas, free training is often seen as less valuable and not worthwhile.

#### 4.2.7.1. COVID-19

COVID-19 has had a major and immediate impact on the operation. All face-to-face workshops were required to stop and were swiftly replaced with high quality online learning courses and materials. COVID-19 impacted timescales, recruitment of sufficient participants to meet planned objectives and retaining of staff. Remote working meant that staff were required to develop new working methods which ultimately impacted team cohesion due to not being able to meet with colleagues regularly. This had a particularly negative impact on new staff members.

However, the pandemic also acted as a catalyst for many individuals to invest in developing new skills and knowledge and also aided in participant recruitment and retention.

#### 4.2.7.2. Brexit

Brexit also had an impact on the M<sup>2</sup>ETaL operation due to the industrial uncertainty created leading to many businesses cutting back on the release of people for training. Further to this, the loss of EU funding is a serious threat, leading to uncertainty regarding the sustainability of the operation.

#### 4.2.8. Lessons Learned

The M<sup>2</sup>ETaL team noted a number of lessons learned throughout the operation. It is important for operations to always be flexible, adaptable, and continuously improving. To achieve success, the staff should have the right set of skills in order to deliver content effectively. To ensure M<sup>2</sup>ETaL was able to deliver on this, the operation ensured effective recruitment, clear direction, and recognition of the need to employ individuals with practical and industrial experience rather than solely knowledge of academic theory. The complex relationship between academia and industry requires understanding and management. Particularly, it is important to understand the skills and knowledge needs in the industry and the subsequent faster response required to close the skills gaps in industry. Further to this, the importance of marketing and industrial engagement should not be underestimated.

Commented [CI(WRM&E28)]: Check formatting here as varies from the above sub-section headers

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Commented [CI(WRM&E30)]: Missing words? 'rather than knowledge of academic theory only'

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#### **4.2.9. Unanticipated Impacts**

A number of anticipated impacts and benefits have been identified for the M<sup>2</sup>ETaL operation. The operation has successfully evidenced that the university can deliver short courses resulting in more people entering higher education. This has also resulted in aiding academics to bridge the gap to industry. Due to the success of the operation, a higher number of participants than expected returned to attend more M<sup>2</sup>ETaL courses. Beyond this, some participants transferred to join the engineering doctorate programme at Swansea University.

Operation staff identified an additional unanticipated benefit in terms of the use of technology, particularly YouTube, to educate a wider audience on science topics. Further to this, having guest blogs from other university projects has helped to break down academic silos and foster collaboration.

The staff at M<sup>2</sup>ETaL have identified an unanticipated impact in the form of transferable core skills which have led to staff upskilling.

#### **4.2.10. Spend Against Budget**

The operation has experienced a minor underspend against budget. As shown in Figures 1 and 2, the underspend relates to redundancy. The operation experienced this underspend as only one staff member took redundancy, with other staff members moving to a new role within the university or having short-term contract extensions, therefore, the redundancy funds were not fully utilised. This is a factor seen in many operations of this nature in which staff seek alternative employment prior to the end of their contract. This underspend was reported to WEFO in quarterly reports and in the operation close report.



<b>West</b>				
<b>Apr-23</b>	<b>Cumulative Profile</b>	<b>Cumulative Claimed</b>	<b>Cumulative Variance</b>	<b>Cumulative Variance %</b>
Flat Rate	£ 927,625.82	£ 899,005.33	-£ 28,620.49	-3.09%
Human Resources Total	£ 36,920.00	£ 5,650.99	-£ 31,269.01	-84.69%
Staff Total	£ 2,281,968.53	£ 2,241,862.28	-£ 40,106.25	-1.76%
<b>OVERALL TOTAL</b>	<b>£ 3,246,514.35</b>	<b>£ 3,146,518.60</b>	<b>-£ 99,995.75</b>	<b>-3.08%</b>
<b>West - breakdown</b>				
<b>Expenditure Type Actual /In Kind /Procurement /Simplified</b>	<b>Cumulative Profile</b>	<b>Cumulative Claimed</b>	<b>Cumulative Variance</b>	<b>Cumulative Variance %</b>
Flat Rate (FR40ESF)	£ 927,625.82	£ 899,005.33	-£ 28,620.49	-3.09%
<b>FLAT RATE</b>	<b>£ 927,625.82</b>	<b>£ 899,005.33</b>	<b>-£ 28,620.49</b>	<b>-3.09%</b>
Redundancy	£ 36,920.00	£ 5,650.99	-£ 31,269.01	-84.69%
<b>Human Resources Total</b>	<b>£ 36,920.00</b>	<b>£ 5,650.99</b>	<b>-£ 31,269.01</b>	<b>-84.69%</b>
Academics	£ 53,006.18	£ 52,717.50	-£ 288.68	-0.54%
Project Delivery Staff	£ 922,245.32	£ 902,094.23	-£ 20,151.09	-2.19%
Project Delivery Staff	£ -	£ -	£ -	0.00%
Project Management	£ 1,306,717.03	£ 1,287,050.55	-£ 19,666.48	-1.51%
<b>STAFF TOTAL</b>	<b>£ 2,281,968.53</b>	<b>£ 2,241,862.28</b>	<b>-£ 40,106.25</b>	<b>-1.76%</b>
<b>OVERALL TOTAL</b>	<b>£ 3,246,514.35</b>	<b>£ 3,146,518.60</b>	<b>-£ 99,995.75</b>	<b>-3.08%</b>

Figure 1: WWV Spend Profile

<b>East</b>				
<b>Apr-23</b>	<b>Cumulative Profile</b>	<b>Cumulative Claimed</b>	<b>Cumulative Variance</b>	<b>Cumulative Variance %</b>
Flat Rate	£ 445,493.40	£ 404,924.66	-£ 40,568.74	-9.11%
Human Resources Total	£ 15,200.00	£ 1,548.52	-£ 13,651.48	-89.81%
Staff Total	£ 1,098,534.00	£ 1,010,763.09	-£ 87,770.91	-7.99%
<b>OVERALL TOTAL</b>	<b>£ 1,559,227.40</b>	<b>£ 1,417,236.27</b>	<b>-£ 141,991.13</b>	<b>-9.11%</b>
<b>East breakdown</b>				
<b>Expenditure Type Actual /In Kind /Procurement</b>	<b>Cumulative Profile</b>	<b>Cumulative Claimed</b>	<b>Cumulative Variance</b>	<b>Cumulative Variance %</b>
Flat Rate (FR40ESF)	£ 445,493.00	£ 404,924.66	-£ 40,568.34	-9.11%
<b>FLAT RATE</b>	<b>£ 445,493.00</b>	<b>£ 404,924.66</b>	<b>-£ 40,568.34</b>	<b>-9.11%</b>
Redundancy	£ 15,200.00	£ 1,548.52	-£ 13,651.48	-89.81%
<b>Human Resources Total</b>	<b>£ 15,200.00</b>	<b>£ 1,548.52</b>	<b>-£ 13,651.48</b>	<b>-89.81%</b>
Academics	£ 19,332.00	£ 19,132.21	-£ 199.79	-1.03%
Project Delivery Staff	£ 329,641.00	£ 307,280.85	-£ 22,360.15	-6.78%
Project Delivery Staff	£ -	£ -	£ -	-
Project Management	£ 749,561.00	£ 684,350.03	-£ 65,210.97	-8.70%
<b>STAFF TOTAL</b>	<b>£ 1,098,534.00</b>	<b>£ 1,010,763.09</b>	<b>-£ 87,770.91</b>	<b>-7.99%</b>
<b>OVERALL TOTAL</b>	<b>£ 1,559,227.00</b>	<b>£ 1,417,236.27</b>	<b>-£ 141,990.73</b>	<b>-9.11%</b>

Figure 2: EW Spend Profile

#### 4.2.11. Strategy Implementation

The operation is developing strategies that will enable M<sup>2</sup>ETaL to sustain the legacy that the operation has developed. The operation is exploring all potential avenues of further funding that could be available to maintain the momentum. Beyond this, the operation is also exploring the opportunity to become a self-funded organisation. M<sup>2</sup>ETaL has demonstrated that continuing the operation can have a major impact on degree apprenticeships and work-based learning programmes with industry, as well as providing funding opportunities to support Doctorates in the future.

It was suggested that a submission should be made to Swansea University for pump priming funding for a core team for 18 months to show that it is commercially viable. This provides Swansea University to take the lead in delivering micro credentials to the metals sector worldwide.

### 4.3. Participating Businesses

During the final evaluation, CIOTEK collected data from 21 participating businesses including 18 from WWV and 3 from EW. The data collected from both regions has been collated due to the similar views expressed.

#### 4.3.1. Industry Sector

The participating businesses work in a range of industry sectors as shown below.

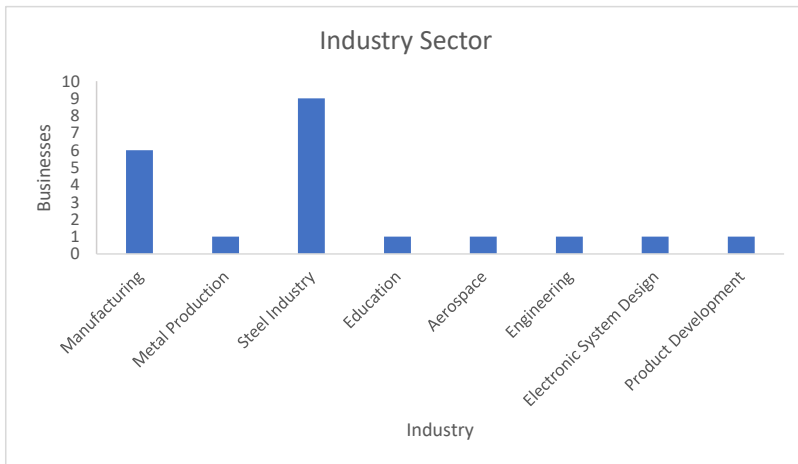


Figure 3: Industry Sector

As indicated, the majority of the participating businesses work in the manufacturing and steel industries.

### 4.3.2. Employees

The number of employees participating in M<sup>2</sup>ETaL varies for each participating business, with the largest number of businesses having over 10 participating businesses.

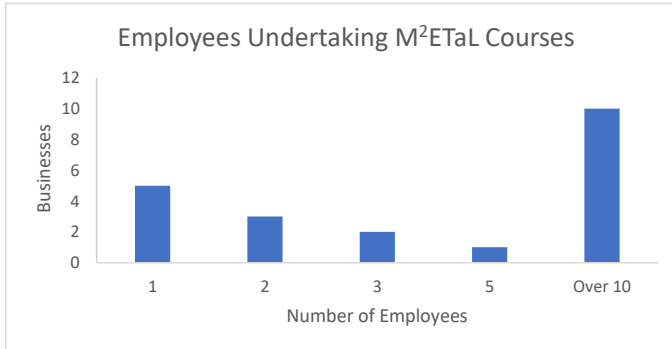


Figure 4: Number of Employees Undertaking M<sup>2</sup>ETaL Courses

### 4.3.3. Awareness of M<sup>2</sup>ETaL

Table 5 highlights the ways in which participating businesses discovered the M<sup>2</sup>ETaL operation.

M <sup>2</sup> ETaL website	1
M <sup>2</sup> ETaL email	5
M <sup>2</sup> ETaL event	1
Colleague	4
Social Media	2
Other website (e.g., University website)	1
Direct contact from M <sup>2</sup> ETaL	4
Third party event	1
Referral from third party	2

Table 5: First Awareness of M<sup>2</sup>ETaL

Participating businesses became aware of M<sup>2</sup>ETaL mostly via email, direct contact with M<sup>2</sup>ETaL as well as through colleagues in their workplace.

#### 4.3.4. Delivery Methods

19 of the 21 participating businesses are happy with the delivery method of M<sup>2</sup>ETaL

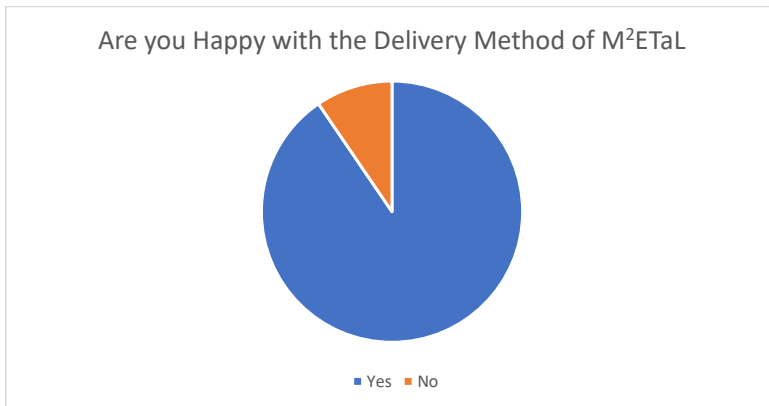


Figure 5: Satisfaction with Delivery Method

For the participating businesses that were happy with the delivery method of M<sup>2</sup>ETaL, businesses suggested the course content was easy to follow and allowed participants to gain in-depth knowledge of the topic. It was believed that the switch to online learning was popular within the workplace due to not being required to be released from the workplace. However, one of the participating businesses that was not happy with the delivery method of M<sup>2</sup>ETaL suggested that there was no feedback provided by M<sup>2</sup>ETaL assessors which made it difficult to know how to progress.

The participating businesses were also asked about their preferred method of course delivery.

100% classroom delivery	4
75% classroom and 25% online delivery	2
50% classroom and 50% online delivery	2
25% classroom and 75% online delivery	4
10% classroom and 90% online delivery	1
100% online delivery	8

Table 6: Course Delivery Preferences

Table 6 shows that the majority of participants prefer only online delivery or online delivery with an element of practical classroom delivery.

Finally, the participating businesses were asked whether the M<sup>2</sup>ETaL courses had met their learning expectations.



Figure 6: Learning Expectations

For 20 of the 21 businesses, the operation had met learning expectations due to the courses being relevant to the businesses and taught by industry experts. For the participating business that indicated that M<sup>2</sup>ETaL had not met their learning expectations, there was suggested to be poor course delivery and no interaction from assessors.

#### 4.3.5. Additional Courses

Due to the success of M<sup>2</sup>ETaL and ability to tailor courses to the needs of the participants, the participating businesses were asked whether they would like to see any other courses offered by M<sup>2</sup>ETaL.

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Figure 7: Desire for Additional Courses

Just over half of the participating businesses suggested that they did not require any additional courses, mainly due to M<sup>2</sup>ETaL already offering a comprehensive variety of courses, some of which have been developed in conjunction with and to meet the needs of the businesses. The participating businesses that would like to see other courses offered by M<sup>2</sup>ETaL indicated a desire for the following:

- Refractories Engineering specific courses
- Auto CAD
- 3D Modelling
- Cryogenic Materials
- FEA Analysis
- Six Sigma
- Plan Condition Monitoring
- Hydraulics specific courses
- Lean Manufacturing
- Life Cycle Analysis

#### 4.3.6. Relevance to Welsh Industry

20 of the 21 participating businesses believe that M<sup>2</sup>ETaL is relevant to Welsh industry due to much of the content aligning with the needs of the industry as well as the operation providing tailored content to meet the needs of the participating businesses.

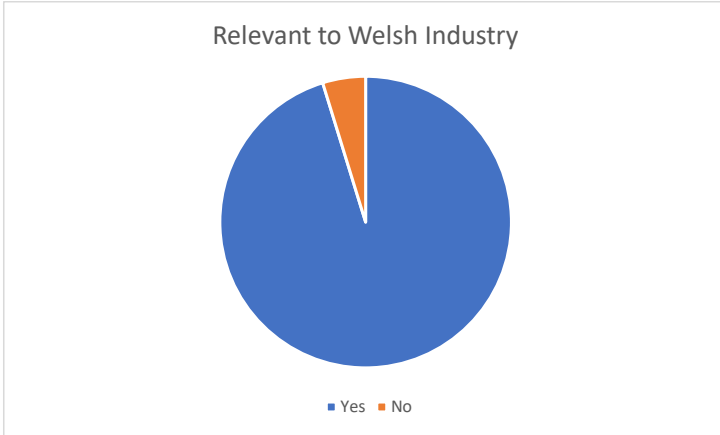


Figure 8: Relevant to Welsh Industry

#### 4.3.7. Engagement in Further Training

Due to the positive experiences many of the participating businesses have had with the M<sup>2</sup>ETaL operation, 20 of the 21 businesses indicated that they and their employers are more likely to engage with training in the future.



Figure 9: Engagement in Further Training

#### 4.3.8. Benefits of Participation

Benefit	Number of Businesses	Value
Increased level of business	11	Up to £1m
Increased employment	8	52
Improved staff competence	20	800+ employees
Increased productivity	15	
Improved quality of service or product	15	Customer related
Improved staff morale and motivation	19	Employees feel invested in, particularly during challenging times
Met legislative requirements	12	
Commitment to staff development	18	
Gained skills relevant to employer	19	
Staff retention	13	5%
Financial gains	9	Up to £1m
Raised staff confidence	20	
Increased flexibility of employees to take on a wider/new range of tasks	19	New skills and raised confidence
New product introduction	10	
New procedure introduced	12	
Ability to respond to changing market conditions	12	
Improved operational performance	15	
Better response to problems	18	
Greater awareness of the full range of engagement opportunities within Higher Education	16	Stimulated interest in training and career development

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**Commented [LS35R34]:** Additional information added below.

Table 7: Benefits Experienced as Reported by Participating Businesses

Table 7 shows the collated benefits the participating businesses experienced as a result of participating in M<sup>2</sup>ETaL including values to indicate some of these benefits. Each of the participating businesses and their employees have reported receiving significant benefits from participating in the M<sup>2</sup>ETaL operation. This includes 20 of the

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participating businesses collectively increasing employment by 52 employees as well as 11 participating businesses increasing their level of business by up to £1 million per annum. Furthermore, as a result of M<sup>2</sup>ETaL, over 800 employees have increased their competence and skills. Many businesses noted that participating in the M<sup>2</sup>ETaL courses has resulted in their employees becoming more competent and having greater confidence in their work as well as offering support in areas beyond the current scope of their job roles. The increased knowledge and skills employees have gained through M<sup>2</sup>ETaL have also caused an increased level of business, employment, competence, staff morale, and confidence.

This shows the extensive benefits the M<sup>2</sup>ETaL operation has brought to many businesses.

Furthermore, the participating businesses were asked to indicate whether the benefits they have experienced are short-term (less than 1 year), medium-term (1-3 years), long-term (3+ years) or no benefits received.

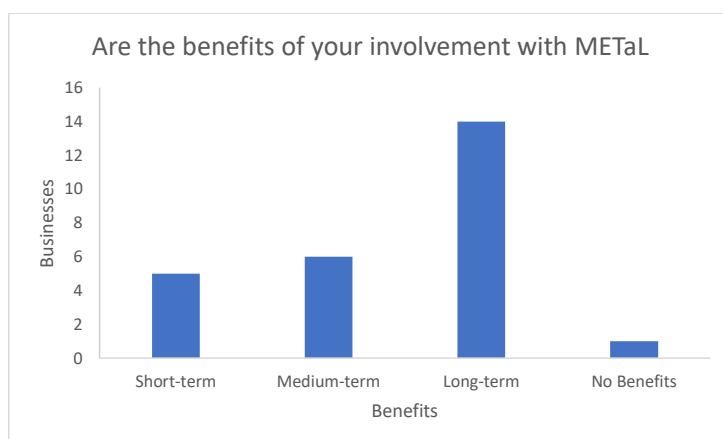


Figure 10: Duration of Benefits

The majority of businesses (14) indicated that the benefits gained from their employees' participation in the M<sup>2</sup>ETaL operation are long-term, this is due to the increased level of knowledge that M<sup>2</sup>ETaL has provided which has also been shared with other team members. M<sup>2</sup>ETaL courses have stimulated the desire for learning and career development, embedded skills, and good practice within businesses. This has overall resulted in a more effective and efficient workforce. However, one business revealed that they have not experienced any benefits as the course could not be completed due to a lack of interaction with the assessors.

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**Commented [LS41R40]:** Number of businesses added.

#### 4.3.9. Suggested Improvements

The businesses were asked to suggest any improvements they believed would be beneficial to the operation moving forward. The feedback included:

- Shorted deadlines to keep information fresh when completing assignments
- Improved interaction with students including providing feedback
- Additional notes to support online learning
- More examples included in presentations
- Group discussion forums for students to interact
- Introduction of more courses
- More practical elements

Many of the participating businesses also noted their disappointment with the ending of the operation due to the lack of funding.

#### 4.3.10. Impact of COVID-19 and Brexit

COVID-19 has had a mixed impact on many of the businesses. The move to at-home working has made on-site training more difficult. However, people are now more willing to complete training and online courses has made this more accessible. M<sup>2</sup>ETaL became a catalyst for making people aware of the opportunities training can provide and more than 10 employees have signed up for Open University courses as a result. COVID-19 has also required many businesses to diversify their skillset and respond to market changes.

Brexit has caused a high level of uncertainty for many businesses moving forward. Some of the participating businesses noted the impact that Brexit has had on the training of their staff and the benefits that will no longer be achieved through training due to the loss of M<sup>2</sup>ETaL. It was also specifically mentioned by the participating businesses that the loss of the M<sup>2</sup>ETaL operation will directly impact the potential to upskill the workforce in Wales.

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**Commented [CI(WRM&E44):** Due to the loss of M2etal?

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### 4.3.11. Quality of M<sup>2</sup>ETaL

Overall, M<sup>2</sup>ETaL has demonstrated that it is an exceptional operation, with many of the participating businesses citing the quality of the operation as excellent.

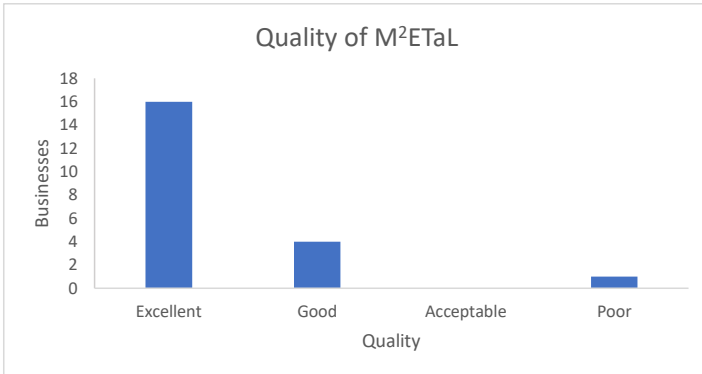


Figure 11: Quality of M<sup>2</sup>ETaL

A number of reasons were provided for the positive rating of M<sup>2</sup>ETaL including:

- Excellent course delivery
- Excellent effort to make courses accessible and to add value
- Relevant courses for workplace skill development
- Very professional staff
- Staff listened to the demands of the industry

The one participating business that gave the operation a rating of poor stated that the course was not worthwhile.

The businesses were also asked if the operation had met their expectations.

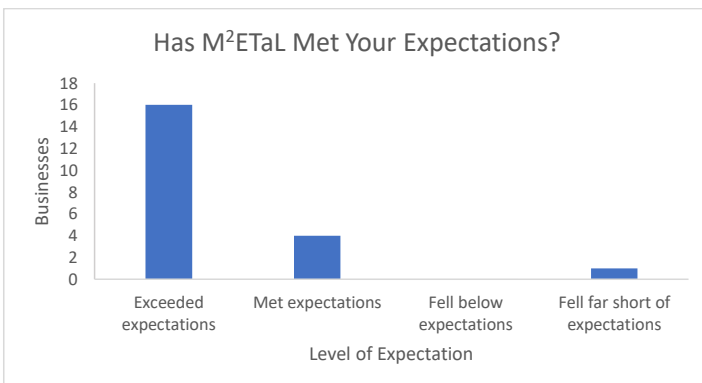


Figure 12: Expectations

M<sup>2</sup>ETaL has exceeded the expectations of the majority of participating businesses due to:

- High quality and extensive content
- Responsive course tutor providing excellent support
- Added significant value to employees
- Provided learning opportunities not otherwise viable without M<sup>2</sup>ETaL
- Improved employee skills and knowledge

#### 4.4. Students

Data has been collated from students on each of the M<sup>2</sup>ETaL courses. This data was student course feedback collected by M<sup>2</sup>ETaL following each students' completion of a course. This resulted in a total of 727 training course reviews. Further to this, CIOTEK also collected data from 70 students participating in M<sup>2</sup>ETaL via electronic questionnaire (See Section 1.2.2.3 for questionnaire details). Please note, not all of the 70 students participating in the evaluation process responded to each of the questions asked, this has resulted in a fewer number of respondents for certain questions, as outlined below.

**Commented [CI(WRM&E46):** Please provide details on how this data was collected and from how many students

**Commented [LS47R46]:** Additional detail included.

##### 4.4.1. Awareness of M<sup>2</sup>ETaL

The students were asked how they first became aware of M<sup>2</sup>ETaL. Table 8 shows the responses received.

Awareness of M <sup>2</sup> ETaL	Number of Students
Newsletter	12
Social Media	9
Direct Contact	17
Through Employer	29
Previous M <sup>2</sup> ETaL course	6
M <sup>2</sup> ETaL Website	1

Table 8: Awareness of M<sup>2</sup>ETaL

#### 4.4.2. Reason for Registering

The students were asked to provide their reasons for registering for a M<sup>2</sup>ETaL course. A number of reasons were stated.

Reason	Number of Students
Personal Development	56
Specific Work Reason	31
Subject Area	36
Cost	20
Remote Learning	27

Table 9: Reason for Registering

There were 5 main reasons given by the participants as to why they registered for a M<sup>2</sup>ETaL course. Of the 70 respondents, 56 identified personal development as a reason for registering. Due to the wide offering of courses, the subject area taught was also a main factor in participants registration. Despite initially being delivered face-to-face, 27 of the students indicated remote learning as a reason for registering for M<sup>2</sup>ETaL courses. This could indicate a high desire for online courses over traditional face-to-face methods.

#### 4.4.3. Course Satisfaction

The M<sup>2</sup>ETaL operation has developed a wide range of courses tailored to the needs of businesses. For each of these courses, the students provided feedback relating to the overall quality of the courses as outlined.

Course	Excellent	Good	Satisfactory	Poor
Process Evolution in the Steel Industry	157	93	0	0
Coke Oven Battery Operations	14	15	2	0
Environmental Issues	27	17	2	0
Ironmaking	12	0	0	0
Sinter	8	2	0	0
By Products	6	0	0	0

**Commented [CI(WRM&E48):** Could a comment be made about the high number citing remote learning as a motivation given that the operation initially delivered face to face? This might have interesting implications for future online delivery

**Commented [SL(49R48):** Additional comment included.

<b>Electroplating Course</b>	0	1	3	0
<b>Steelmaking and casting</b>	10	9	2	0
<b>Introduction to Materials</b>	17	15	0	0
<b>Arc Welding</b>	12	3	0	0
<b>An Introduction to Tinplate Production</b>	57	12	0	0
<b>Advanced Imaging</b>	2	1	0	0
<b>Design for Reliability</b>	27	22	0	0
<b>Corrosion and Coating</b>	11	6	0	0
<b>Practical Metallurgy</b>	19	21	1	0
<b>CAD</b>	14	7	0	0
<b>Manufacturing Technology</b>	9	7	0	0
<b>An Introduction to Materials Testing</b>	4	2	0	0
<b>Hot Rolling Fundamentals</b>	32	12	0	0
<b>Fibre Optics Course</b>	0	5	2	1
<b>Joining</b>	2	0	0	0
<b>Energy and Power</b>	34	1	1	0
<b>Marine Logistics and the Production of Hot Metals</b>	1	5	0	0
<b>Total</b>	457	256	13	1

Table 10: Course Quality

As the table shows, the students have given the M<sup>2</sup>ETaL operation high rating for each of the courses. Overall, for the 23 courses listed, the operation received just 1 rating of poor and 13 ratings of satisfactory. Oppositely, the operation received 457 excellent ratings, accounting for 63% of the overall ratings. In particular, the process evolution in the steel industry has been highly attended and regarded as an excellent course. This highlights the success and high quality of the operation.

#### 4.4.3.1. Course Content

The students were asked to rate how happy they were with the course content. As indicated in the figure below, the majority (85%) of the 68 students who responded to this question suggested that the course content provided by M<sup>2</sup>ETaL was excellent or good, with only a small number (15%) of students giving M<sup>2</sup>ETaL content a rating of satisfactory or poor.

**Commented [CI(WRM&E50):** In this and the following sections could figures be added to the text to support points e.g. the majority (x%)...

**Commented [SL(51R50):** Percentage added.

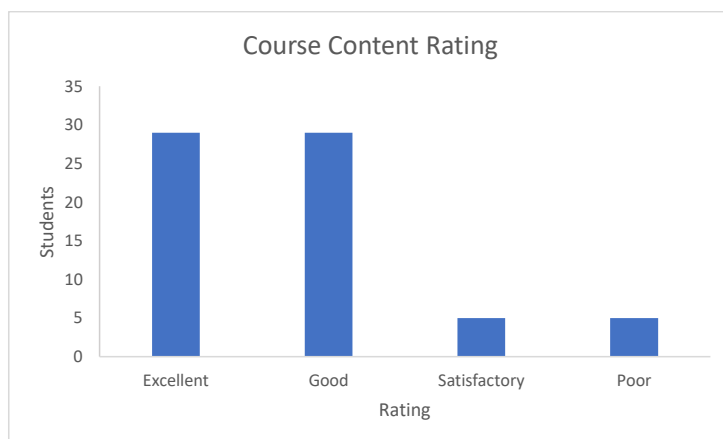


Figure 13: Course Content Rating

#### 4.4.3.2. Course Navigation

The students were also asked about their experience navigating the M<sup>2</sup>ETaL course. The navigation was rated as excellent by the majority (59%) of the 70 students with very few students indicating the navigation of the course was satisfactory (9%) or poor (4%).

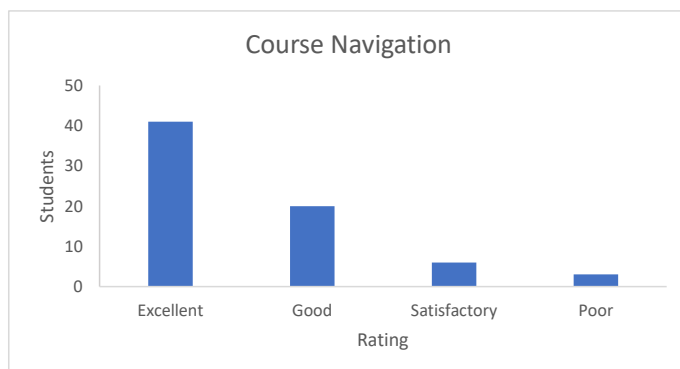


Figure 14: Course Navigation

#### 4.4.3.3. Relevance of Topics Covered

The students were asked to rate the relevance of the topics covered in the course. Again, the M<sup>2</sup>ETaL operation was given a rating of excellent or good by 64 of 70 students, meaning that for most, the operation provides relevant content.

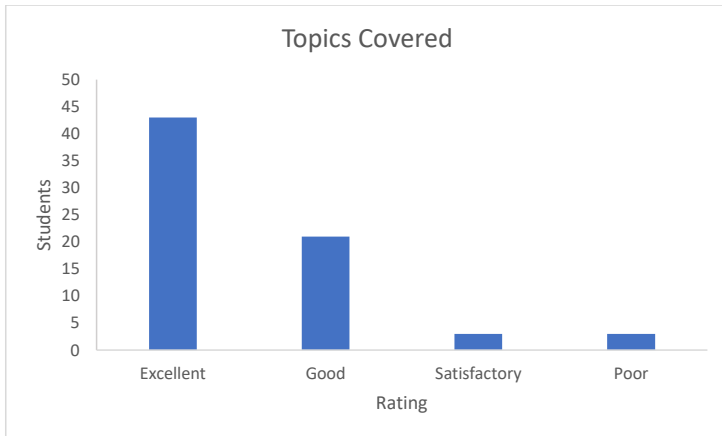


Figure 15: Relevance of Topics Covered

#### 4.4.3.4. Audio Quality

The M<sup>2</sup>ETaL operation provides an audio element within its content. Overall, the audio was rated by the students as excellent (47%) or good (39%), showing the operation provides high quality audio for the students.



Figure 16: Audio Quality



#### 4.4.4. Challenges with M<sup>2</sup>ETaL

The students were asked to discuss any challenges they faced with the M<sup>2</sup>ETaL operation. For the majority of the students, no challenges were faced, however, for a small number the following challenges were mentioned:

- Difficulty enrolling for the course including forms and links not working
- Further explanation of diagrams required
- Presentation slides and audio did not always align.
- Navigation menus are not intuitive or easy to use
- Background music of some of the videos could be distracting
- Further explanation required regarding the use of equations

These challenges can be easily addressed by the M<sup>2</sup>ETaL operation moving forward.

#### 4.4.5. Positive Aspects of M<sup>2</sup>ETaL

The students indicated a number of positive aspects of the M<sup>2</sup>ETaL operation.

- Short and sharp nature of the courses
- Easy to navigate
- Ability to complete modules at your own pace
- Having audio on slides was helpful and aided in the flow of the course
- The course helped participants to understand their job role better
- Very good breadth and depth of the course

It is noted that the majority of participants indicated that the M<sup>2</sup>ETaL operation is very good and has provided participants with the knowledge and skills relevant to their workplace.

#### 4.4.6. Participant Feedback

Throughout the operation, M<sup>2</sup>ETaL has received feedback via email and LinkedIn posts as outlined:

*"It seemed strange (in a good way) to be a Swansea University student as I passed my sixtieth birthday, but that what happened when I signed up for the online Manufacturing Technology course with the Metal Project. I've just finished the course and very much enjoyed it. It is a wide-ranging, high-level review of processes from casting to forging, machining to extruding; from sintering to welding and heat treatment to surface treatments. Chemical Engineers are, by nature, collectors of*

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Commented [CI(WRM&E54): Including these testimonials as images means that some accessibility software won't pick them up - would suggest including these as text

Commented [SL(55R54): Testimonials included as text.

*knowledge from other people's disciplines. I'm sure some of the information I picked up on this course is going to come in useful soon".*

*"After finishing the online Manufacturing Technology Course with METaL Project, I signed up for, and have just completed, the online Introduction to Materials Engineering. It was another great course, leaning towards the metallic tradition but with excursions into polymers and ceramics. A few things were familiar, like tensile testing and the short section on chemistry. However, the metallurgy was new and really interesting as many of the terms (annealing, normalising, tempering etc) were well known to me. However, if you'd asked me to explain them before this course I'd have struggled. Now I know my austenite from my martensite (and my pearlite from my Bainite), as well as having a better idea why alloys are harder than pure metals and an improved appreciation of the words brittle and ductile. I also enjoyed the sections on the iron / iron-carbide phase diagram and non-equilibrium cooling. The course is a great introduction to Materials Engineering".*

*"I've just completed the Corrosion and Coatings Technology with Metal Project / Swansea University. It's the third online course I've done with METaL and they've all been good. This one started gently and then ramped up impressively! I learned a lot about crevices and pitting as well as sensitisation and inhibitors. It's been a long time since I'd thought about electrochemistry, but I enjoyed learning about Pourbaix, Tafel and Evans diagrams (all new to me). I would recommend the course to anyone looking for an introduction to corrosion and corrosion protection".*

The email feedback provided stated:

- I Really enjoyed the course and have found it extremely beneficial.
- I have reached out to a M<sup>2</sup>ETaL tutor in the past for help and they've been fantastic.
- Manufacturing Technology was of benefit to me as it furthers my understanding of manufacturing processes and links in well with the other courses that I have done.
- I thought the course was very informative and I learnt a lot about methods and technologies I never knew existed. Thanks for putting it all online, it was good to be able to learn about this through distance learning.

#### 4.4.7. Engagement in Further Training

The participants were asked whether they would be interested in participating in further training, with 47 students responding.

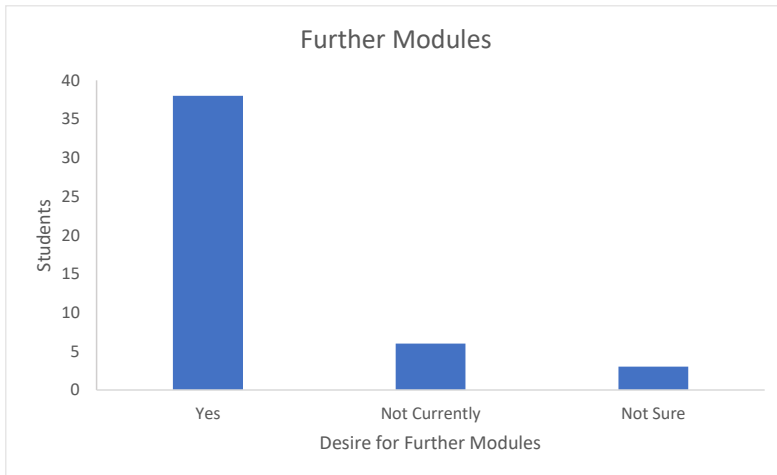


Figure 17: Further Modules

As shown, 38 of the students would like to participate in further M<sup>2</sup>ETaL courses, with an additional 6 not currently looking to participate in modules and 3 students unsure. This shows that the M<sup>2</sup>ETaL operation has been highly successful. Some of the respondents suggested further topics of study:

- Follow up CAD course
- Mechanical engineering
- Nuclear
- Hydrogen
- Paint stripping/removal
- Plating and corrosion inhibition focused on smaller mechanical parts
- FEA analysis
- Six Sigma
- Condition monitoring
- Artificial intelligence
- Circular economy
- Industry 4.0
- Data science
- Fluid power
- Packaging products
- Metallurgy relating to the workplace
- Continuous improvement tools

- LCAs
- Decarbonisation of steel
- Salt spray testing

## 4.5. Stakeholders

CIOTEK undertook interviews with two M<sup>2</sup>ETaL stakeholders. The findings from these discussions are outlined below.

### 4.5.1. Overall Performance

The stakeholders indicated that the operation has performed very well against targets, particularly in WWV. In addition, the operation team has managed to work within the budget. The operation has overcome some major obstacles including having to restructure the operating and delivery methods to online as a result of COVID-19. The level of course development of a university led programme has been highly successful in its application to an in-company workforce with lower educational attainments. In comparison, the EW operation has performed less well in meeting defined targets, however, the operation has been of increased benefit to companies operating in the region.

### 4.5.2. Performance Against CCTs

The stakeholder indicated that the original, and revised targets for female participation were very challenging, but the operation has influenced and supported a positive number of women gaining a qualification in the workplace. The stakeholders were highly complementary of the work undertaken by the M<sup>2</sup>ETaL team leading to the success of the operation. The operation has overcome many obstacles, including COVID-19 and delays in getting EW underway, however, the team has been quick to adapt to new ways of working in an online environment developing and delivering new and market relevant courses and materials in environment, circular economy, and energy and power. There is evidence of a significant take-up by women both in the levels of upskilling achieved and in the resulting opportunities for better employment, career progression and personal motivation. Some of these outcomes may prove more long-term if M<sup>2</sup>ETaL are able to secure future funding. It has been a real achievement for a growing number of women in Wales to gain qualifications in non-traditional manufacturing industries, to which M<sup>2</sup>ETaL has contributed.

It was acknowledged that M<sup>2</sup>ETaL has excelled in all areas of CCT activity. The operation had 7 CCT case level indicators associated with its activity, and all have been delivered, and publicity outlining success through case studies, press releases, sharing good practice had been an important part of the operation. M<sup>2</sup>ETaL supported female participation in STEM, the University's Welsh Language Scheme and a bilingual website and e-learning platform. In addition, the operation has produced a

blog to showcase the amount of support given to participants attending courses and encouraging females from all educational and social backgrounds to participate and succeed.

#### **4.5.3. Current Market Needs**

There is a continuing need to integrate sustainable development into awareness raising, education and training programmes. M<sup>2</sup>ETaL has evidenced that employers are allowing and encouraging employees to undertake repeat training and this is a very positive outcome. The evidence from feedback suggests that employers achieve productivity improvements when employees have a greater level of technical or job specific skills gained at an intermediate or higher level through education or learning. Based on the M<sup>2</sup>ETaL experience, it is believed that in a changing economic worldwide environment, and with specific shortages of qualified technical people in Wales and the UK, the market need is reaching a critical stage. This can be addressed by the continuation of the M<sup>2</sup>ETaL operation. A stakeholder noted that there are well publicised reports outlining the shortages of qualified technical people in Wales due to lack of investment in training. M<sup>2</sup>ETaL has demonstrated the value of raising awareness of the continuing need to increase skills at intermediate and higher levels through relevant education and learning. The operation has supported a considerable number of companies and provided focus and relevance for getting more people involved in upskilling.

#### **4.5.4. Future Market Need**

It is believed that there is future market need for the M<sup>2</sup>ETaL operation. The target market has been identified, relevant training products have been developed and the results of the intervention have been extremely encouraging for Wales. The implication from Brexit necessitates new thinking moving forward if Wales is to further exploit the successful collaborations with industrial partners and to build on achievements and benefits gained. The learning that has taken place can be a springboard should possibilities for a future initiative emerge, the need for which is greater than ever. There is an opportunity to elevate the critical nature of having the mechanisms and strategy in place to provide education and skills at all workshop levels. This type of unique approach developed by M<sup>2</sup>ETaL should be maintained and supported to ensure that the gains made are not lost going forward.

#### **4.5.5. Future Funding Opportunities**

It has been identified that, to a large extent, new funding opportunities is in the hands of the UK Government, Welsh Government and Local Authorities. There is a need to have core funding secured and allocated to keep this type of operation going and to not lose momentum and the benefits gained through M<sup>2</sup>ETaL. The UK Government promises after Brexit have not been fulfilled and this has resulted in universities and the public sector losing out. It is unlikely that the private sector would be in a position to fully fund such an operation given the financial challenges faced by industry at the present time. It remains to be seen how the EU will approach the closures of all existing operations, and whether this may provide a limited opportunity to continue. The library

of training materials developed and available at Swansea University might provide the basis for discussion about the value and further use to industry, and this may open the door for a funding provider or collaborator.

#### 4.6. SWOT Analysis

The SWOT analysis illustrated below was completed during the final evaluation based on discussions with M<sup>2</sup>ETaL team members and participating businesses.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>➤ Adaptable response and tailored courses to business needs</li> <li>➤ Team of highly skilled, knowledgeable, and dedicated staff</li> <li>➤ Unique course material including high specification of online materials</li> <li>➤ Strong and effective leadership</li> <li>➤ High quality delivery</li> <li>➤ Well-structured courses</li> <li>➤ Development of strong industrial relationships</li> <li>➤ Track record of excellence</li> <li>➤ Ability to address all social mobility aspects and meet CCT targets</li> <li>➤ Short and high impact courses</li> <li>➤ Direct and frequent contact between lecturers and participants</li> <li>➤ Accommodation of participants by providing training outside of business hours</li> <li>➤ Willingness of operation staff to travel to businesses to deliver content</li> <li>➤ Future proofing courses addressing net zero</li> </ul>	<ul style="list-style-type: none"> <li>➤ Restrictions of geographical location</li> <li>➤ Funding guidelines were not always flexible to meet specific business demands</li> <li>➤ University module credit requirement did not always meet business needs</li> <li>➤ Challenge to measure upskilling or effectiveness in the absence of formal qualifications</li> <li>➤ Difficulty establishing relationships with new businesses</li> <li>➤ Bureaucracy of paperwork and processes</li> <li>➤ Lack of job security</li> </ul>

Opportunities	Threats
<ul style="list-style-type: none"> <li>➤ Ability to offer micro credentials</li> <li>➤ Self-funded training operation receiving income through the provision of courses</li> <li>➤ M<sup>2</sup>ETaL courses can be offered to participants beyond WWV including to interested international partners</li> <li>➤ Seeking new funding partnerships that were constrained by WEFO</li> <li>➤ Commercialisation of courses and materials</li> <li>➤ Online courses can be offered to a wider audience</li> <li>➤ Courses can be tailored and developed to individual businesses</li> </ul>	<ul style="list-style-type: none"> <li>➤ Lack of funding</li> <li>➤ Loss of key staff including professional digital web developers and animation experts that were key to maintaining online courses</li> <li>➤ Loss of momentum</li> <li>➤ Loss of relationships</li> <li>➤ Reduced ability to enhance and improve materials</li> <li>➤ Competition from other academic establishments that may see the opportunity to exploit the market need for tailored courses in advanced materials and manufacturing technologies</li> <li>➤ Lack of vision in Wales for strategic intervention</li> </ul>

Table 11: SWOT analysis

## 4.7. Impact Analysis

Primary research conducted with M<sup>2</sup>ETaL staff and participating businesses explored the short (completion of the operation), medium (3 years) and long-term (3+ years) impacts the operation has or is likely to have.

Impacts	
<b>Short-term</b>	<ul style="list-style-type: none"><li>➤ Increased knowledge and experience</li><li>➤ Gave businesses the required skills for their workplace</li><li>➤ Educational experience including qualifications</li><li>➤ Built confidence in abilities</li><li>➤ Provided networking opportunities</li></ul>
<b>Medium-term</b>	<ul style="list-style-type: none"><li>➤ Increased participants confidence and sense of achievement</li><li>➤ Potential industry process improvement</li><li>➤ More engaged workforce</li></ul>
<b>Long-term</b>	<ul style="list-style-type: none"><li>➤ Promotion or career development opportunities</li><li>➤ Upskilled and more engaged industry workforce</li><li>➤ Embedded best practice</li><li>➤ Employers more likely to engage with future training</li></ul>

Table 12: Impact Analysis



# 5

## Report Sections

Executive Summary

Section 1: Introduction

Section 2: Mid-Term Report Outcomes

Section 3: Operational Review

Section 4: Evaluation Findings

**Section 5: Conclusions and Recommendations**

## 5. Conclusions and Recommendations

### 5.1. Conclusions

Following an extensive review of the M<sup>2</sup>ETaL operation at the final stage, it is evident that the operation is highly successful and has provided extensive benefits to its participants. M<sup>2</sup>ETaL aligns to many policies and strategies, contributing to the upskilling of the Welsh workforce.

The operation has evidenced a detailed M&E plan that has been updated throughout the operation, with discussions regularly held regarding M&E progress. M<sup>2</sup>ETaL has a comprehensive process in place to capture data required including forms, feedback, and databases. The M<sup>2</sup>ETaL team has also promoted the operation at events, attended conferences, released press articles, featured in newsletters, and was mentioned at the Senedd.

M<sup>2</sup>ETaL has contributed to CCTs with activities embedded throughout the operation. M<sup>2</sup>ETaL also align with the principles of the Well-Being of Future Generations Act.

The operation received a reprofile which saw the expansion of activities to EW. Regarding WWV, the operation fell short in many of its targets, although the operation has achieved a high percentage in many areas. However, the operation exceeded the target of “female participants with a Level 3 qualification. The achievement of this target is particularly important as engineering continues to be a male-dominated profession. The operation also fell short in many of its EW targets due to the numerous challenges faced. It was identified that the operation needed additional time establish and build relationships with organisations. The extension to EW also occurred prior to the COVID-19 pandemic when the operation was providing face-to-face delivery which presented a challenge to businesses in terms of cost and travel. However, the operation again exceeded its targets relating to female participation in courses.

M<sup>2</sup>ETaL made excellent contributions towards the additional output targets, particularly in West Wales. The operation exceeded 6 of its targets in West Wales including students identifying as female, Black, Asian, and Minority Ethnic people, Older, young, migrant, and as having carer responsibilities. The operation also has a high percentage achievement of male students and those with a disability in West

Wales. Due to the challenges faced in recruitment, the operation has fallen short of output targets in EW.

Despite M<sup>2</sup>ETaL not meeting all its indicator targets, the feedback gained during interviews has made it clear that M<sup>2</sup>ETaL has been a high quality and invaluable operation that has provided great benefit to participants and businesses delivering increased levels of skill, knowledge, confidence, and employment. This has also led to an acknowledge upskilling of the Welsh industry sector. As a result of the extensive benefits experienced many of the businesses interviewed and participating students requested that the M<sup>2</sup>ETaL operation continue.

Overall, it has been evidenced that the M<sup>2</sup>ETaL operation has remained true to its ambitions, and its achievements can be attributed to a number of key success factors which it is recommended are adopted as best practice for any future operation.

In summary these are:

- A clear vision combined with strong leadership focused on achieving impact and meeting defined targets.
- Open engagement and discussion with participating businesses to identify their specific requirements.
- Flexibility in the design and delivery of short courses and micro credentials in industry specific sectors.
- A focus on key areas of expertise and establishment of a network of external support organisations.

These findings highlight the requirement for the continuation of the M<sup>2</sup>ETaL operation moving forward to continue the development and upskilling of the Welsh workforce.

## 5.2. Recommendations

### Recommendation 1 – Maintain the Momentum

At this current time, M<sup>2</sup>ETaL has developed excellent relationships with a variety of companies and participants, with many signing up to complete multiple courses. The loss of momentum at this stage could have a detrimental impact, not only on the operation, but the participants utilising M<sup>2</sup>ETaL. As such, a break in transmission will result in the loss of key relationships with industry partners and the loss of knowledgeable and skilled staff working on the M<sup>2</sup>ETaL operation. Further to this, a loss of continuity will mean that the operation material that M<sup>2</sup>ETaL has strived to continuously enhance and improve to provide an accurate and updated reflection of current information will no longer be up to date. Therefore, it is recommended that M<sup>2</sup>ETaL seek ways by which it might continue the operation.

### **Recommendation 2 – Seek Further Funding to become Self Sustaining**

In order to continue the operation, it is recommended that M<sup>2</sup>ETaL seek additional funding. It is recommended that this be based on a business model which will become self-sustaining with 18 months based on “pump priming” funding as an enabler to allow the operation to establish relationships and allow time for organisations, used to grant funding to become accustomed to paying for skills development training. Ironically it will be those outside the immediate region, not used to grant funding that may prove to be the most receptive. It is suggested that this funding should initially come from a combination of Swansea University and Welsh Government and should focus on the delivery of micro credentials. (Short, focused, and accredited courses that do not tie up employees for extended periods but deliver focused industry specific training). It is recommended that, to break the cycle of “grants culture” that there is a commercial charge put on these courses from the outset to establish the commercial viability of the operation in the shortest possible time.

### **Recommendation 3 – Development of CPD**

Many of the students and participating businesses emphasised the desire to utilise M<sup>2</sup>ETaL courses to enhance their knowledge and skills in specific areas relating to their employment. It is recommended that M<sup>2</sup>ETaL develop CPD courses (micro-credentials) that will address business needs rather than the attainment of a formal qualification.

### **Recommendation 4 – Extend the Geographical Area of Delivery**

Due to the constraints of the funding guidelines, the M<sup>2</sup>ETaL operation has been limited to a small geographical region. Beyond the current funding period, it is recommended that the operation extend its participant pool by offering courses both across the UK and internationally. With the move to online learning, the current delivery method lends itself particularly well to being an attractive opportunity for those in wider regions beyond Wales.